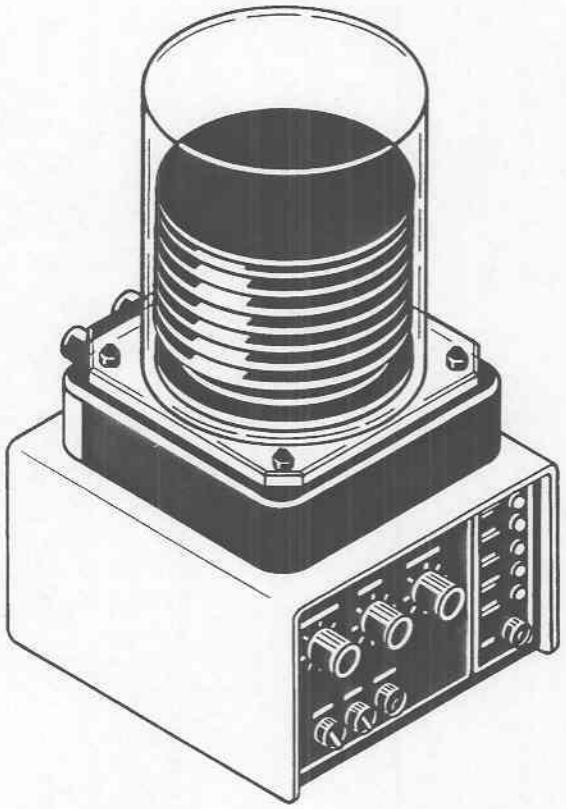
Ohmeda

7000 Anesthesia Ventilator

(Multi-Voltage Electronic)

Operation and Maintenance Manual



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User Responsibility

This Product will perform in conformity with the description thereof contained in this operating manual and accompanying labels and/or inserts, when assembled, operated, maintained and repaired in accordance with the instructions provided. This Product must be checked periodically. A defective Product should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, Ohmeda recommends that a telephonic or written request for service advice be made to the nearest Ohmeda Regional Service Center. This Product or any of its parts should not be repaired other than in accordance with written instructions provided by Ohmeda and by Ohmeda trained personnel. The Product must not be altered without the prior written approval of Ohmeda's Safety Department. The user of this Product shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, improper repair, damage, or alteration by anyone other than Ohmeda.

⚠CAUTION: Federal law in U.S.A. and Canada restricts this device to sale by or on the order of a licensed medical practitioner.

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Precautions

⚠Warnings

Do not attempt to operate the ventilator until this manual has been read in its entirety.

Danger - Possible explosion hazard if the unit is used in the presence of flammable anesthetics.

If the system's Adjustable Pressure Limiting (APL) Valve is fully closed, nearly closed or removed from the circuit, very high pressures can occur in the patient circuit. If no additional pressure relief valve is in the patient circuit, these pressures, under some circumstances, may be higher than the ventilator maximum inspiratory driving gas pressure.

Proper placement of the pressure sensing tee is very important. The tee must be placed in the Expiratory limb of the patient circuit, and must be installed with the tee nipple pointing upward. Improper placement could result in accumulation of condensate in the pressure sensing line and inaccurate pressure readings.

To help insure proper function of the ventilator Low Airway Pressure Alarm, clear accumulated condensate from the pressure sensing tube immediately.

Do not connect the ventilator Exhaust directly to a vacuum source. The vacuum may remove required gases from the patient circuit.

This ventilator is designed to be powered by oxygen only. Using any other gas will cause inaccurate operation and may damage the ventilator, resulting in possible injury to the patient.

Do not use the ventilator until all the Preoperative Checkout Procedures have been performed and correct operation has been verified. Perform these procedures before each case.

Do not use the ventilator if it fails any part of the checkout procedure. Remove for service.

Fire Hazard - Never oil or grease any anesthesia or oxygen equipment. In general, oils and greases oxidize readily and in the presence of oxygen, they will burn violently.

Proper placement of the pressure sensing tube is very important. The tube must be placed in the Expiratory limb of the patient circuit. To help insure proper function of the ventilator Low Airway Pressure Alarm, clear accumulated condensate from the pressure sensing tube immediately.

Sterilize the bellows assembly periodically to minimize the risk of cross-infecting patients. Use a sterilization schedule that complies with your institution's infection-control and risk-management policies. Use Ohmeda-approved sterilization methods.

Liquids or any foreign materials trapped in the driving-gas circuit of the pop-off valve or the bellows base can impair the valve's operation. Do not use the pop-off valve or the bellows base if you suspect that materials are trapped. Have the assembly repaired by trained service personnel.

Following ethylene oxide sterilization, quarantine the equipment in a well-ventilated area to allow dissipation of absorbed ethylene-oxide gas. In some cases, aeration periods of seven days or more may be required. Aeration time can be decreased when special aeration devices are used. Follow the sterilizer manufacturer's recommendations for aeration periods required.

⚠Cautions

Maximum tidal volume for the Pediatric Bellows Assembly is 300 mL. The unit will volume limit before the Set Volume Not Delivered Alarm activates.

If used with an extension cord, the unit may be subject to Electro-Magnetic interference.

The input voltage to the ventilator from the mains outlet must be the same as that indicated in the window on the power inlet module on the rear panel of the control module. Operating the ventilator with an incorrect input voltage may damage the ventilator or cause it to malfunction.

No repair should ever be undertaken or attempted by anyone not having proper qualifications and equipment.

Perform the Preoperative Checkout Procedure after cleaning and sterilizing the bellows assembly.

Do not disassemble the Pop-Off Valve.

1/Introduction

1.1 General

See Figure 1.

⚠WARNING: Do not attempt to operate the ventilator until this manual has been read in its entirety.

DANGER - Possible explosion hazard if the unit is used in the presence of flammable anesthetics.

The Ohmeda 7000 Electronic Anesthesia Ventilator is electronically controlled and pneumatically driven. It is specifically designed for anesthesia use.

Features include:

1. A patient circuit which is separate from the driving gas circuit.
2. A bellows assembly which can be sterilized.
3. Operator controls which feature direct setting of physiologic parameters on linearly calibrated scales.
4. Use with either an adult or pediatric bellows assembly (see Section 1.2. D).
5. Visible and audible alarms which indicate abnormal conditions.

Mounting accessories are available for various types of setup within an anesthesia system. The ventilator can also be used freestanding on a shelf or table top. See Section 2 for setup instructions.

The following sections describe ventilator components and features in more detail. Read each section carefully.

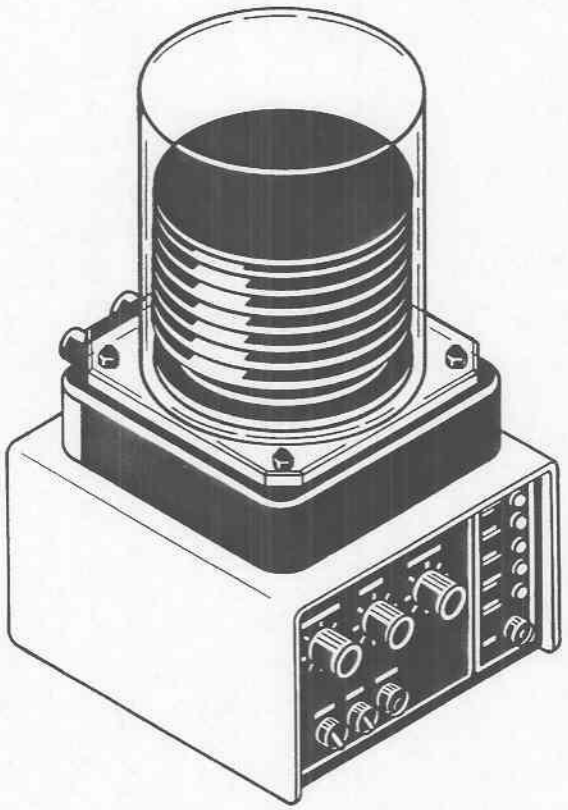


Figure 1
Ohmeda 7000 Electronic Anesthesia Ventilator Bellows Assembly Attached to Control Module

1/Introduction

A. Ventilator Modules

The ventilator consists of two modules: the bellows assembly and the control module. Depending on the anesthesia system used, the bellows may be mounted either on top of or remote from the control module. Flexible hoses are used to connect the bellows assembly to the control module and other anesthesia system components. The control module pneumatically drives the bellows according to the ventilator control settings.

See Figure 2.

Bellows Assembly

The bellows ascends from the bellows base and is protected by a transparent plastic housing. Approximate Tidal Volume is read on the housing's imprinted scale. There are three connection ports in the bellows base. Section 2 gives instructions for making the bellows assembly connections.

Control Module

All ventilator controls and alarm indicators are located in the control module. There are also three connectors in the control module back panel. Section 2 gives instructions for making the control module connections.

B. Controls

There are six controls on the control module front panel and one control (Altitude Adjustment) behind the access plate on the back panel. These controls are described below.

Minute Volume Dial - Use to set the desired value for exchanged gas. Settings range from 2 to 30 liters per minute (L/min).

Rate Dial - Use to set the ventilation rate (desired number of breaths per minute). Settings range from 6 to 40 breaths per minute (Breaths/min).

I:E Ratio Dial - Use to set the ratio of inspiration time to expiration time. Settings range from 1:1 to 1:3.

Power Switch - Use to switch electrical power On (1) or Off (O).

Sigh Switch - When on, provides a "sigh" (150% of the tidal volume, limited to a maximum 1.5 liters) once every 64 breaths.

Manual Cycle Button - Push to manually initiate a ventilation cycle. Initiates cycle during the expiration phase only.

Altitude Adjustment Control Dial - Use to set the altitude at which the ventilator is used. Settings range from 0 to 1800 meters. Remove the access plate to change the dial setting.

Note: Recalibration is required at altitudes above 1800 meters. Consult the 7000 Electronic Anesthesia Ventilator Service Manual or an Ohmeda Service Representative.

C. Alarms

There are seven alarms plus a Lamp Test Button in the control module. Six of the alarms are visible and audible, but the Power Failure Alarm is audible only. The alarms are described below.

Ventilator Failure Alarm - Warns that a problem has developed in a critical area within the unit. The red alarm lamp blinks and the audible alarm sounds intermittently. If the alarm activates, discontinue ventilator use. Note: This alarm also activates when a patient circuit high pressure condition exists without relief throughout two to three consecutive ventilation cycles. See Section 1.3 B for more information.

Set Volume Not Delivered Alarm - Warns that the control settings are adjusted to require a tidal volume greater than 1.5 liters (1.6 liters is the maximum tidal volume which can be generated). The red alarm lamp blinks and the audible alarm sounds intermittently. If the alarm activates, change the control settings to establish a tidal volume within the allowable range. Note: This alarm also activates if a patient circuit high pressure condition exists. See Section 1.3.B for more information.

Low Oxygen Supply Pressure Alarm - Warns of low oxygen supply pressure either in the ventilator or elsewhere in the oxygen supply line. The red alarm lamp blinks and the audible alarm sounds intermittently when the driving gas pressure at the ventilator inlet is less than approximately 40 psig. Low oxygen supply pressure will cause the ventilator output to be less than the Minute Volume setting. If the alarm activates, discontinue ventilator use.

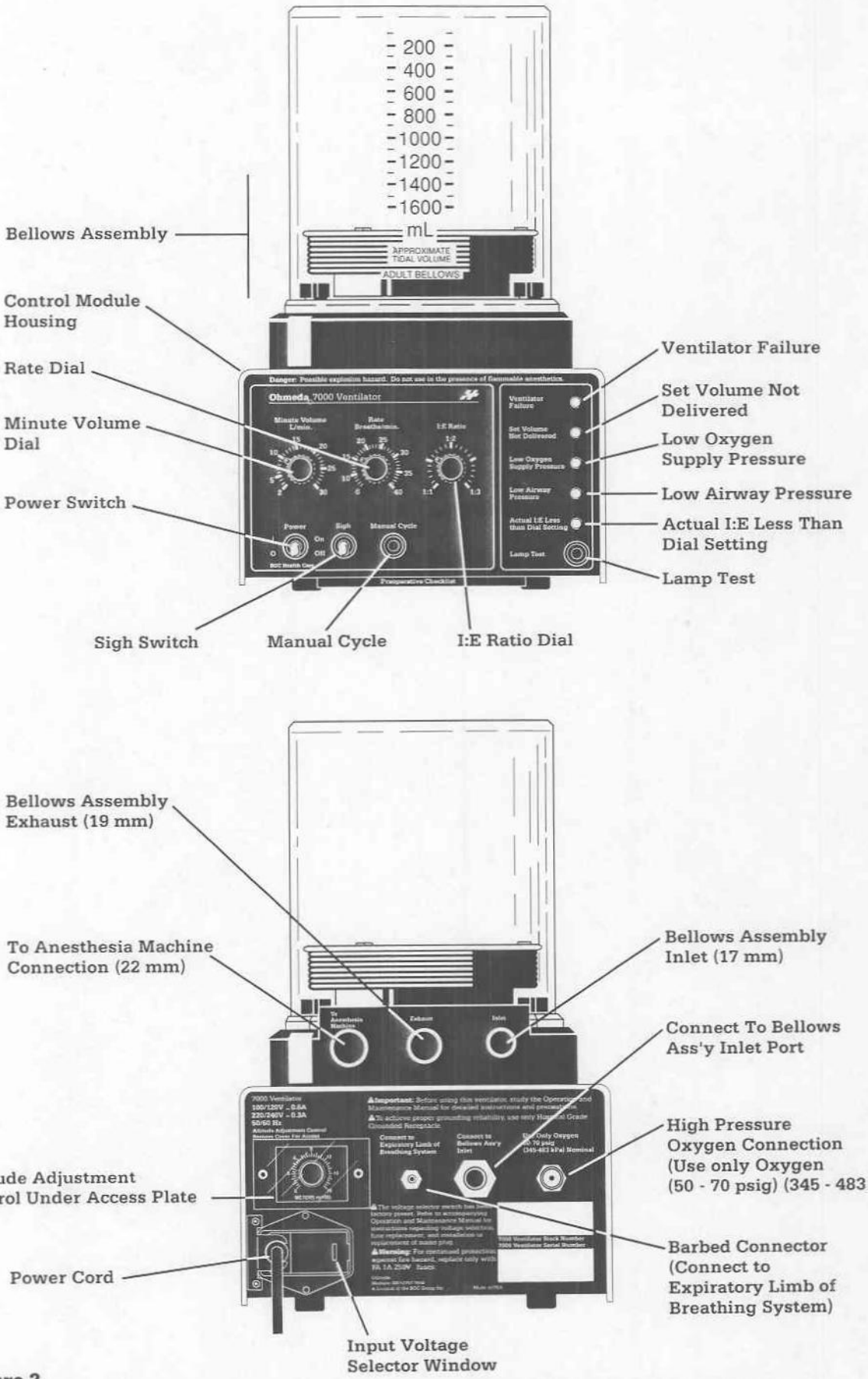


Figure 2
Ohmeda 7000 Electronic Anesthesia Ventilator: Front View (Top) and Back View (Bottom)

Low Airway Pressure Alarm - Warns of pressure absence in the patient circuit. The red alarm lamp blinks and the audible alarm sounds intermittently if, after two to three consecutive ventilation cycles, pressure within the patient circuit is not at least 6 cm H_2O.

Actual I:E Less Than Dial Setting Alarm - Warns that the control settings are adjusted to exceed the ventilator's operational limits. The red alarm lamp lights steadily (without blinking) and the audible alarm sounds continuously. If the alarm activates, change the control settings to bring the I:E ratio within the allowable range.

Total Alarm - Warns that there has been a failure of the internal circuitry. If all the alarm lamps light and the audible alarm sounds (except during a lamp test), discontinue ventilator use.

Power Failure Alarm - Warns that the Power Switch is On (I) but there is no electrical power. The alarm is audible only. The alarm is powered by a Ni-Cad battery which is automatically recharged when the ventilator is plugged in and the electrical Power Switch is On (I).

All alarms, except the Ventilator Failure Alarm, are self-canceling; that is, when normal conditions are reestablished, the alarms turn off automatically. The alarms cannot be turned off manually.

Lamp Test - Push this button to test alarm functions. All lamps should light and the audible alarm should sound. If the alarms do not activate, there is a malfunction. Do not use the ventilator until it is repaired.

1.2 Accessories

A. Freestanding Ventilator Mounting

The freestanding ventilator can be set on a shelf or mounted on various mounting arms, brackets and stands using one of the mounting kits available from Ohmeda. Kits are also available for mounting the freestanding ventilator on all Ohmeda Anesthesia Systems.

Note: On an Ohmeda Excel Anesthesia System, the Remote Ventilator Arm (Stock No. 1001-8903-000) is also required.

Always use a mounting kit appropriate for your anesthesia system. Consult an Ohmeda Representative for recommendations.

B. Interface Mounting Kits

See Figure 3.

Three special interface mounting kits are available for connecting the ventilator bellows to the Ohmeda Gas Management System (GMS) Absorber:

- For Ohmeda Modulus II Anesthesia System (Stock No. 0219-7518-810)
- For the Ohmeda Excel Anesthesia System (Stock No. 1001-8907-000)
- For other anesthesia systems (Stock No. 0236-0510-800)

Note: When using an interface mounting kit, place the ventilator control module on an anesthesia system shelf or above the Flow Control Assembly in a Modulus II Anesthesia System.

Interface mounting kits include:

1. brackets and hardware to mount the ventilator bellows assembly on the absorber,
2. a manifold which interfaces ventilator bellows assembly ports with absorber ports,
3. a bellows inlet adapter, and
4. necessary tubing, connectors and hanger tabs.

Installation instructions are supplied with the kits.

Section 2.2 gives instructions for making interface manifold connections.

C. Bag to Ventilator Selection

See Figures 4 and 8.

When the ventilator is used in an anesthesia system which includes the Ohmeda Model 21 Absorber or Bain Circuit Adapter, the Bag to Ventilator Switch Valve (Stock No. 0207-8022-801) can be installed. The Switch Valve allows alternation between rebreathing bag use (manually controlled ventilation) and ventilator use (mechanically controlled ventilation). The switch installs on the bag connection port of the absorber or Bain Circuit Adapter.

See the Bag to Ventilator Switch Valve Operation and Maintenance Manual (Stock No. 0178-1747-000) for more information.

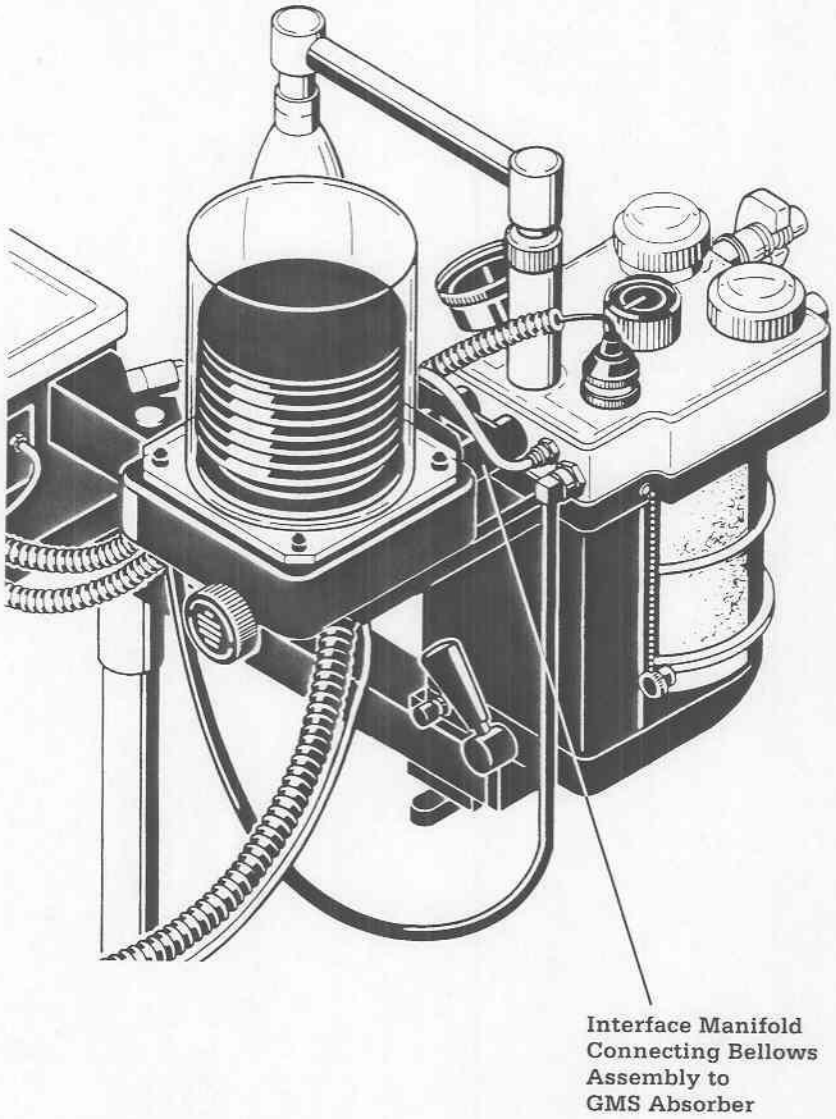


Figure 3
Absorber to Ventilator Bellows Interface

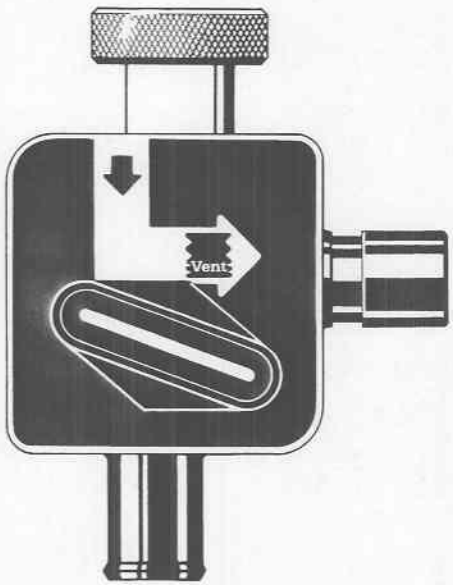


Figure 4
Bag to Ventilator Switch Valve

D. Pediatric Bellows Assembly

See Figure 5.

The Ohmeda 7000 Electronic Anesthesia Ventilator easily converts to pediatric use by replacing the entire adult bellows assembly with the Pediatric Bellows Assembly (Stock No. 0219-7520-871). Installation instructions are included with the bellows assembly.

The assembly consists of a base, a pediatric bellows subassembly and bellows housing.

The Approximate Tidal Volume scale has a 0 to 300 mL range.

The Minute Volume range for the Pediatric Bellows is 2 to 12 liters per minute.

The Set Volume Not Delivered Alarm does not function when the Pediatric Bellows Assembly is used. Since the maximum tidal volume for the Pediatric Bellows Assembly is 300 mL, and the alarm allows a maximum tidal volume setting of 1.5 liters before activation, the controls may be set to exceed the Pediatric Bellows tidal volume limit without alarm activation. For example, if the controls are set to deliver a tidal volume of 1 liter, the control module can deliver this volume, but any volume over the 300 mL maximum bellows volume will be vented through the ventilator's pressure limiting valve (see Section 1.3 B) without activating the alarm.

⚠CAUTION: Maximum tidal volume for the Pediatric Bellows Assembly is 300 mL. The unit will volume limit before the Set Volume Not Delivered Alarm activates.

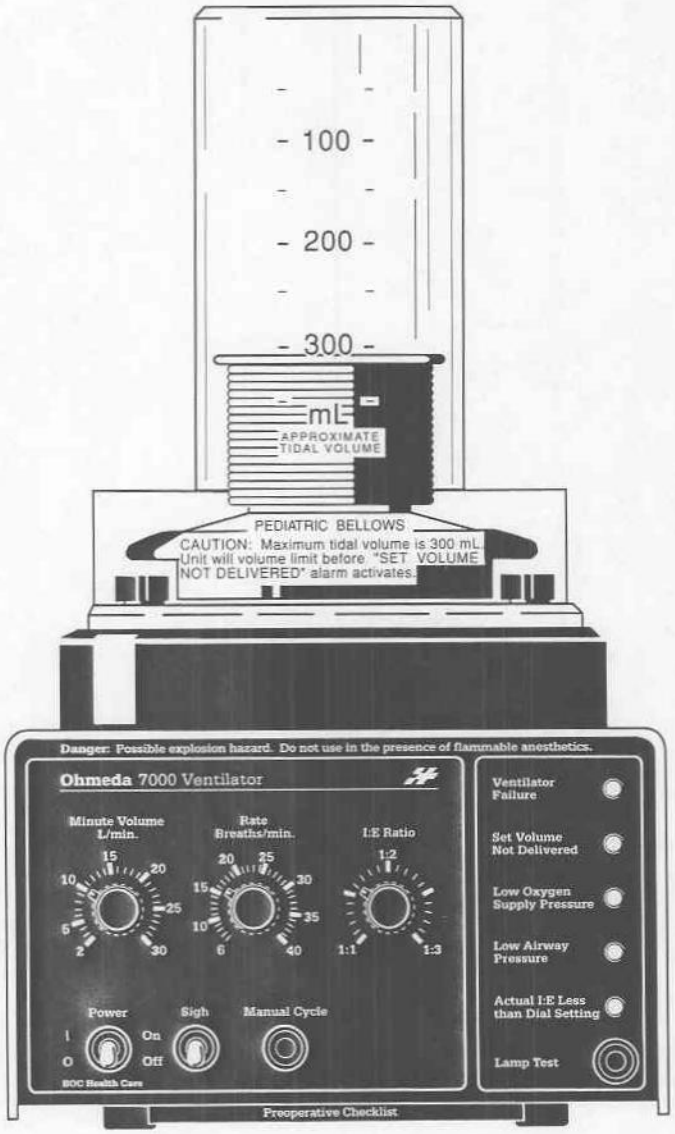


Figure 5
Ventilator with Pediatric Bellows Assembly Attached

1.3 Theory of Operation

A. Control Module Functions

The control module performs three basic functions:

- **Computation** - computes tidal volume, inspiration time, expiration time, and inspiratory flow according to the settings of the Minute Volume, Rate and I:E Ratio dials. Section 1.3.C explains the mathematical relationships between dial settings and the values they establish.
- **Driving Gas Delivery** - delivers the required driving gas volume (computed electronically by control module circuitry) into the bellows during the inspiration phase of the ventilation cycle. Section 1.3.B explains driving gas function during the ventilation cycle.
- **Alarm Activation** - activates alarms which indicate that some abnormal conditions exist within a monitored function. These functions are described in Section 1.1.C.

B. Ventilation Cycle

See Figure 6.

The bellows assembly acts as the interface between the control module's driving-gas circuit and the patient breathing system.

During inspiration, driving gas from the control module compresses the bellows downward. During expiration, breathing system gas fills the bellows, forcing it to rise. As the ventilator cycles from inspiration to expiration and back, a set of valves (an exhalation valve in the control module and a pop-off valve in the bellows assembly's base) controls the pressures in the two circuits.

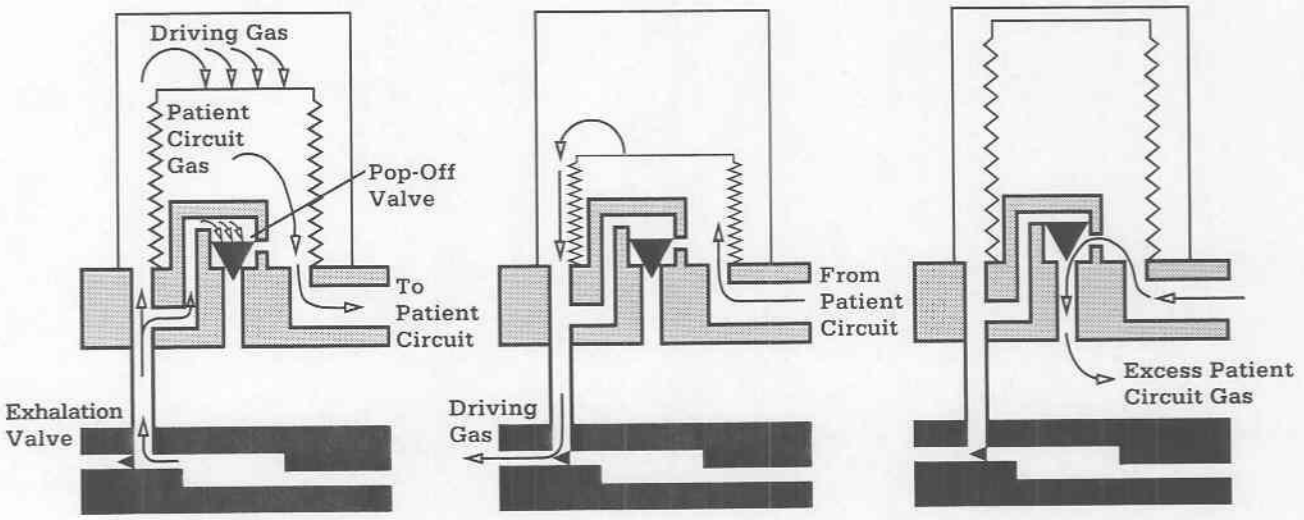
Inspiratory Phase

Note: The anesthesia system's flush valve may be used to fill (extend) the bellows before switching the ventilator On (I) and starting patient ventilation. Assume, for the purpose of discussion that ventilation begins with the bellows extended and filled with gas.

Inspiration starts when the ventilator's control module closes the exhalation valve and delivers driving gas to the area surrounding the bellows in the housing. As the driving-gas pressure increases, closing the pop-off valve, the bellows starts to compress downward. This downward pressure forces gas out of the bellows, into the breathing system, and finally into the patient's lungs.

The control module, which computes the volume, rate, and timing of the driving gas needed based on its front panel settings, delivers driving gas until it reaches the calculated gas volume; then flow stops.

Note: If the patient circuit gas pressure, as detected at the pressure sensing tee, exceeds 65 to 75 cm H_2O, a pressure switch opens the exhalation valve and exhausts the remainder of the inspiration phase driving gas. A high pressure condition activates the **Set Volume Not Delivered** alarm. If the high pressure condition continues without relief throughout



The start of inspiration. The control module closes the exhalation valve and delivers driving gas to the area around the bellows.

The beginning of expiration. The exhalation valve opens and gas flow in the breathing circuit and driving-gas circuit reverses. Driving gas is released into the atmosphere as the bellows extends.

If during the expiratory cycle (when the bellows has extended completely) the pressure inside the bellows exceeds about 2.5 cm H_2O, the pop-off valve opens, releasing any excess breathing system gas through the bellows assembly's exhaust port.

Figure 6
The Ventilation Cycle

two to three consecutive cycles, the **Ventilator Failure** alarm activates, and the ventilator stops cycling.

Expiratory Phase

At the start of expiration, the exhalation valve opens and the gas-flow direction reverses in both circuits. The combination of fresh gas from the anesthesia machine and exhaled gases from the breathing system enters the bellows' interior, forcing the bellows to expand. The extending bellows displaces the driving gas, which the exhalation valve releases into the atmosphere.

If the pressure inside the bellows exceeds about 2.5 cm H_2O during the expiratory cycle (when the bellows has extended completely), the pop-off valve opens and releases any excess breathing system gas through the bellows assembly exhaust port.

C. Mathematical Relationships and Computations

Dial Settings

The control module computes and establishes four operating parameters based on the front panel control dial settings. These parameters can be mathematically calculated using the value of the control dial settings. The following examples show how to calculate the four parameters computed by the control module.

Definition of variables used in examples:

MV = Minute Volume (liters per minute of exchanged gas set on the Minute Volume dial)

R = Ventilation Rate (breaths per minute set on the Rate dial)

I:E = Ratio of Inspiration to Expiration time (set on the I:E Ratio dial)

TV = Tidal Volume (the volume in liters or milliliters of each breath)

I = Inspiration Time (time in seconds during which gas is is supplied to the patient's lungs)

E = Expiration Time (the time in seconds during which gas is exhaled from the patient's lungs, including any end expiratory pause)

F = Flow (the actual inspiratory flow at any given instant expressed in liters per minute)

Example 1:

The dial settings are :
Minute Volume (MV) = 8
Rate (R) = 12
Inspiration to Expiration Time (I:E Ratio) = 1:2

Note: I:E Ratio can be expressed as E/I with I = 1.

To find the Tidal Volume (TV):

$$TV = \frac{MV}{R} = \frac{8}{12} = 0.667 \text{ liters (667 mL)}$$

To find the Flow (F):

$$F = MV\left(1 + \frac{E}{I}\right) = 11E = 8\,(1+2) = 8(3) = 24 \text{ L min}$$

To find the Inspiration Time (I):

$$I = \frac{60}{R\left(1 + \frac{E}{I}\right)} = \frac{60}{12(1+2)} = \frac{60}{36} = 1.67 \text{ seconds}$$

To find the Expiration Time (E)

$$E = \frac{60\left(1 - \frac{1}{\frac{1+E}{I}}\right)}{R} = \frac{60\left(1 - \frac{1}{1+2}\right)}{12} = \frac{60(1 - 0.333)}{12}$$

$$= \frac{60(0.667)}{12} = \frac{40.02}{12} = 3.33 \text{ seconds}$$

Example 2:

Using the calculation for Tidal Volume (TV), the following example shows how control dial settings can activate the Set Volume Not Delivered Alarm.

The dial settings are:
Minute Volume (MV) = 18
Rate (R) = 6

$$TV = \frac{MV}{R} = \frac{18}{6} = 3 \text{ liters}$$

But 3 liters is greater than the maximum 1.5 liters which the ventilator can deliver; consequently, the Set Volume Not Delivered Alarm activates. The dial settings must be changed to values which allow the ventilator to function within its limits. Do this by increasing the Rate setting or decreasing the Minute Volume setting.

Example 3:

Using the calculation for Flow (F), the following example shows how control dial settings can activate the Actual I:E Less Than Dial Setting Alarm.

The dial settings are:
Minute Volume (MV) = 20
Inspiration to Expiration Time (I:E Ratio) = 1:3

$$F = MV\left(1 + \frac{E}{I}\right) = 20\,(1+3) = 20(4) = 80 \text{ L min}$$

But the maximum flow that the ventilator can deliver is 60 L min. If the computation for Flow (F) is solved for E/I it can be seen that

$$\frac{E}{I} = \frac{F - MV}{MV}$$

Using 60 L/min for Flow (F) and the Minute Volume (MV) setting of 20,

$$\frac{E}{I} = \frac{60 - 20}{20} = \frac{40}{20} = 2.0 \text{ (or 1:2).}$$

The actual I:E Ratio of 1:2 is less than the set I:E Ratio of 1:3; consequently, the Actual I:E Less Than Dial Setting Alarm activates. The dial settings must be changed to values which allow the ventilator to function within its limits.

The graphs in Figure 7 represent the ventilator functions monitored by the two alarms discussed.

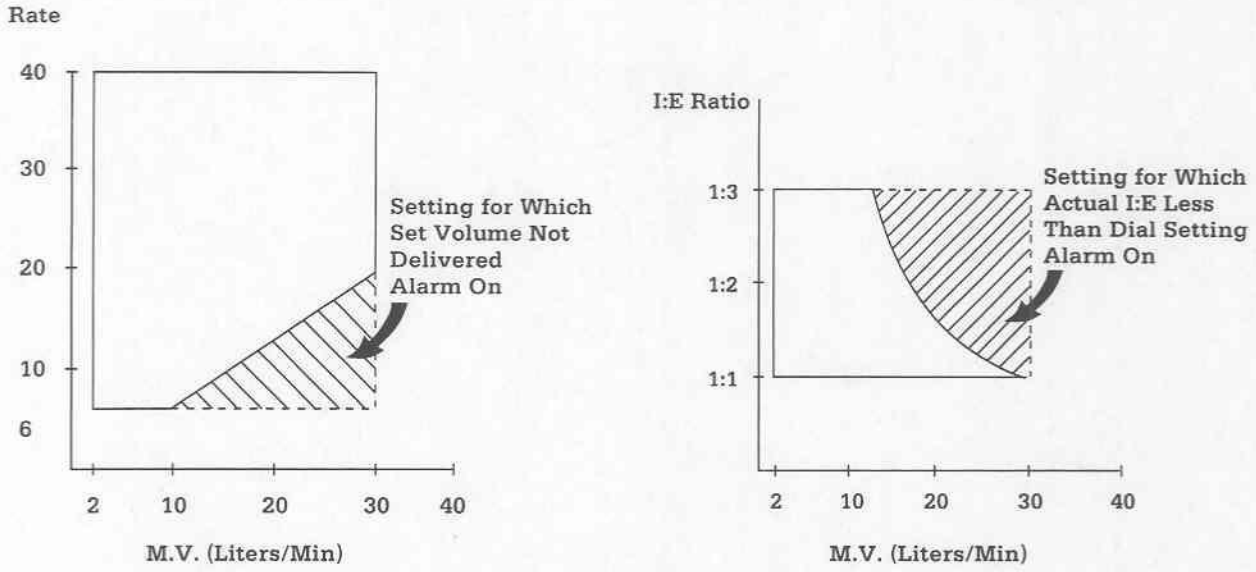


Figure 7
Ventilator Functions - Set Volume Not Delivered and Actual I:E Less Than Dial Setting Alarms.

Ventilator Settings and Volume Monitor Readings

When using a volume monitor in the anesthesia system, you may notice that the exhaled volume measured by the monitor usually does not match the settings on the ventilator. In most cases this is normal. The volume monitor measures the patient's actual exhaled volume, which—because of a number of factors—will usually be different than the set ventilator volume.

Use the measured volume as a guide when setting the ventilator.

Factors contributing to differences between the set volume and the measured volume include breathing system compliance, fresh gas flow, breathing system leakage, the location of the volume sensor within the breathing system, and airway resistance.

- Compliance:

  Because of the compressibility of gases and the expansion of some breathing system components under pressure, not all of the gas delivered from the ventilator enters the patient's lungs. Instead of reaching the patient, some of the gas the ventilator delivers is needed to raise the breathing system pressure to peak inspiratory pressure. Higher peak inspiratory pressures result in greater volume losses.

- Fresh gas flow:

  Any fresh gas flow the anesthesia machine introduces to the breathing system during inspiration will be delivered to the patient in addition to the gas the ventilator delivers. Higher fresh gas flows will result in greater gains in volume.

- Leakage:

  Breathing system leakage during inspiration reduces the delivered volume. Higher breathing system pressures will result in greater leakages and greater volume losses. In a properly maintained breathing system, leakage is usually small.

- Location of the volume monitor sensor:

  When the volume sensor is in the proximal location—on the patient side of the "Y" connector—the monitor measures only the patient's exhaled volume. When, however, the volume sensor is in the distal location—at the absorber's exhalation check-valve port—the monitor measures the patient's exhaled volume plus the compliance volume in the section of the patient circuit that is between the absorber's inhalation and exhalation check valves and the patient. This compliance volume is not delivered to the patient.

  Although volumes measured distally will always be artificially higher than those measured proximally, the difference between the measurements will usually be small (about 2 to 3 mL/cm H_2O) when standard, 30-to-40-inch-long, patient-circuit tubing is between the absorber and the patient. Adding volume to the circuit, for example by connecting a humidifier in the inspiratory limb, increases the difference between distally-measured volumes and proximally-measured volumes.

- Airway resistance:

  High airway resistance, caused by a small endotracheal tube or other airway obstruction, may reduce the volume the ventilator delivers to the patient. A volume delivered at a high inspiratory flow may be partially restricted from reaching the lungs, causing a larger than normal portion of that volume to remain in the breathing system. You can determine if airway resistance is a factor in your system by reducing the I:E Ratio. If the measured volume increases, then high airway resistance is a factor.

During operation compensate for these factors by adjusting the ventilator controls so that the measured volume indicates the ventilation level you want to use. Occasionally, however, you may want to calculate the volume you expect to measure by using the following steps.

1. Calculate minute volume delivered to the patient circuit (MVct), using the following formula.

   MVv = Ventilator Minute Volume dial setting

   FG = Total fresh gas flow in liters per minute from anesthesia system

   E = Expiration setting on ventilator I:E Ratio dial

   I = 1 (Inspiration setting is always 1 on the I:E Ratio dial)

$$MVct = MVv + \frac{FG}{1 + \frac{E}{I}}$$

   For Example:

   MVv = 10
   FG = 4
   E/I = 3 (because the I:E Ratio is set at 1:3)

$$MVct = 10 + \frac{4}{1 + 3} = 10 + 1 = 11 \text{ liters per minute}$$

2. Determine the circuit compliance factor by doing the following:

   Note: Because of gas compressibility and breathing circuit expansion under pressure, not all of the volume delivered from the bellows enters the patient's lungs. The difference between the tidal volume delivered from the bellows and that delivered to the patient may be large enough to warrant compensation.

   Exact compensation is not practical, but reliable compliance factors can be determined using the following method:

   a. Connect the ventilator into the patient circuit as if ready for use, but plug the Y connector.

   b. Set the ventilator controls for a tidal volume of 200 mL, then switch on the ventilator.

   c. Record the maximum pressure reached in the patient circuit.

   d. Divide the tidal volume (200 mL) by the maximum patient circuit pressure to find the circuit compliance factor.

3. Calculate the minute volume lost to compliance (MVc) using the following formula.

   ΔP = Pressure change (cm H_2O) as read on pressure gauge during inspiration
   R = Ventilator Rate dial setting
   C = Compliance factor expressed in mL cm H_2O

Note: The compliance factor is different depending on the components used in the anesthesia system. Make sure the correct compliance factor is used. See Step 2.

$$MVc = \frac{\Delta P \times R \times C}{1000}$$

For example:

$\Delta P = 30$
$R = 15$
$C = 10$

Note: 10 mL/cm H_2O is the approximate total compliance factor used for a Modulus II Anesthesia System with a GMS Absorber and appropriate breathing circuit.

$$MVc = \frac{30 \times 15 \times 10}{1000} = \frac{4500}{1000} = 4.5 \text{ liters per minute}$$

4. Subtract MVc from MVct to find the delivered patient minute volume (MVd).

   MVd = MVct - MVc

   For example, using the results from Steps 1 and 2 above:

   MVct = 11
   MVc = 4.5
   MVd = 11 - 4.5 = 6.5 liters per minute

1.4 Specifications*

A. Electrical Characteristics

⚠CAUTION: If used with an extension cord, the unit may be subject to Electro-Magnetic interference.

Input Voltage: 100/120/220/240 V ac ± 10% 50/60 Hz

⚠CAUTION: The input voltage to the ventilator from the mains outlet must be the same as that indicated in the window on the power inlet module on the rear panel of the control module. Operating the ventilator with an incorrect input voltage may damage the ventilator or cause it to malfunction.

Power Consumption: 53 watts maximum

Power Supply Alarm Battery: 7.2 volt dc, Nickel Cadmium (rechargeable)

Charge Time: Less than 21 hours to full charge

Note: The alarm battery is trickle charged continuously during use.

B. Performance Characteristics

Minute Volume Range:
Adult Bellows Assembly: 2 to 30 L/min.
Pediatric Bellows Assembly: 2 to 12 L/min.

Ventilation Rate Range: 6 to 40 breaths per minute

I:E Ratio Range: 1:1 to 1:3 for minute volumes from 2 to 15.5 L min. For minute volumes between 15.5 and 30 L min, see Figure 7.

Tidal Volume: 1.5 liters maximum. See Section 1.3 for Tidal Volume relationship.

Approximate Tidal Volume Scale Range:
Adult Bellows Housing: 100 to 1600 mL
Pediatric Bellows Housing: 0 to 300 mL

Inspiratory Flow Range: 4-60 L/min

Nonadjustable Pressure Relief (Driving Gas Pressure): Nominal 65 cm H_2O

High Pressure Relief (detected at Pressure Sensing Tee): 65 to 75 cm H_2O

Driving Gas Oxygen Supply Requirements:
50 - 70 psig (345 - 483 kPa) at 70 L/min flow

Sigh Volume: 150% of Tidal Volume, limited to a maximum of 1.5 liters

Sigh Rate: 1 every 64 breaths

Ventilator Compliance:
With Adult Bellows:
Approximately 3 mL per cm H_2O
With Pediatric Bellows:
Approximately 1.5 mL per cm H_2O
Note: Compliance for connecting hoses are not included in this specification.

Altitude Compensation Range: Sea level to 1800 meters

Note: Recalibration required at altitudes above 1800 meters.

C. Physical Characteristics

Weight: 19 lbs. (8.5 kg)

Dimensions:
Depth: 9.2" (23.4 cm)
Width: 8.7" (22.1 cm)
Height: 14.3" (36.3 cm)

* All Specifications are nominal and subject to change without notice.

2.1 Setup

Upon delivery, inspect the ventilator and its accessories for signs of damage which may have occurred during shipment. If damage is found, notify the transportation company and file a damage claim immediately.

Store the original shipping container in an accessible place and use it if you need to reship the ventilator.

Check that the proper operating voltage is displayed on the power inlet module on the ventilator's rear panel. If it is not, refer to the instructions in section 3.4 for changing the input voltage.

⚠CAUTION: The input voltage to the ventilator from the mains outlet must be the same as that indicated in the window on the power inlet module on the rear panel of the control module. Operating the ventilator with an incorrect input voltage may damage the ventilator or cause it to malfunction.

Remove the access plate over the Altitude Adjustment Control by removing the two socket head cap screws. Set the dial to the altitude at which the ventilator is being used (consult map, airport or local weather bureau). Replace the access plate.

Prepare the ventilator for use as described in Section 2.2. Ventilator functions should be checked as soon as possible by a person experienced with devices of this nature.

The ventilator should be thoroughly checked prior to every patient connection and use.

2.2 Ventilator Connections

Connections will vary depending on the individual components assembled to make up the complete patient circuit. It is essential that the user have a thorough knowledge of each component and its interface with other components so that all patient circuit connections are made correctly. Read the operation and maintenance manual for each component of the patient circuit. Set up and operate all anesthesia equipment in accordance with accepted clinical practice.

⚠WARNING: If the system's Adjustable Pressure Limiting (APL) Valve is fully closed, nearly closed or removed from the circuit, very high pressures can occur in the patient circuit. If no additional pressure relief valve is in the patient circuit, these pressures, under some circumstances, may be higher than the ventilator maximum inspiratory driving gas pressure.

The following setup instructions assume that the ventilator and all other components of the anesthesia system have been properly mounted.

A. Bellows Assembly Attached to Control Module

With Ohmeda Model 21 Absorber

See Figure 8.

1. Use the 10 inch long, 15 mm diameter corrugated tube (driving gas tube) to connect the bellows assembly Inlet port to the control module outlet port labeled Connect to Bellows Ass'y. Inlet.
2. Fit one end of the clear 1/8 inch ID pressure sensing tube on the control module's barbed connector labeled Connect to Expiratory Limb of Breathing System.
3. Fit the other end of the sensing tube over the pressure sensing tee nipple.

   ⚠WARNING: Proper placement of the pressure sensing tee is very important. The tee must be placed in the Expiratory limb of the patient circuit, and must be installed with the tee nipple pointing upward. Improper placement could result in accumulation of condensate in the pressure sensing line and inaccurate pressure readings.
4. Install the pressure sensing tee in the circuit as shown in Figure 8. The tee must be placed in the patient circuit between the absorber exhalation check valve and the expiratory limb corrugated breathing tube. Make sure the pressure sensing tee nipple points upward.

   Note: A 15 mm distal pressure sensing tee (Stock No. 0219-7486-800) can be special ordered. If used, this tee must be placed in the expiratory limb of the patient circuit or at the end of the Y connector to achieve a proper pressure reading.

   The pressure sensing tee must be placed in the patient circuit or the Ventilator Low Airway Pressure Alarm will sound continuously.

   ⚠WARNING: To insure proper function of the ventilator Low Airway Pressure Alarm, clear accumulated condensate from the pressure sensing tube immediately.

5. Use a 19 mm diameter corrugated tube to connect the bellows assembly Exhaust port to an appropriate gas scavenging system.

   ⚠WARNING: Do not connect the ventilator Exhaust directly to a vacuum source. The vacuum may remove required gases from the patient circuit.

6. Use a 22 mm diameter corrugated tube to connect the To Anesthesia Machine port to the desired location in the anesthesia circuit (generally to an absorber mounted switch valve or to the absorber exhalation check valve bag connection).

7. Use a suitable high pressure hose (female oxygen DISS fitting at the ventilator end and appropriate connector at the oxygen source) to connect the ventilator inlet (labeled Use Only Oxygen (50 - 70 psig) (345 - 483 kPa) to an oxygen source. An oxygen high pressure hose is not supplied with the ventilator.

   ⚠WARNING: This ventilator is designed to be powered by oxygen only. Using any other gas will cause inaccurate operation and may damage the ventilator, resulting in possible injury to the patient.

8. Plug the power cord into a properly grounded hospital grade outlet. The label on the back panel of the control module indicates the power requirements for operating the unit. The setting for the ac voltage for operating the unit can be found in the window on the power inlet module on the back of the unit.

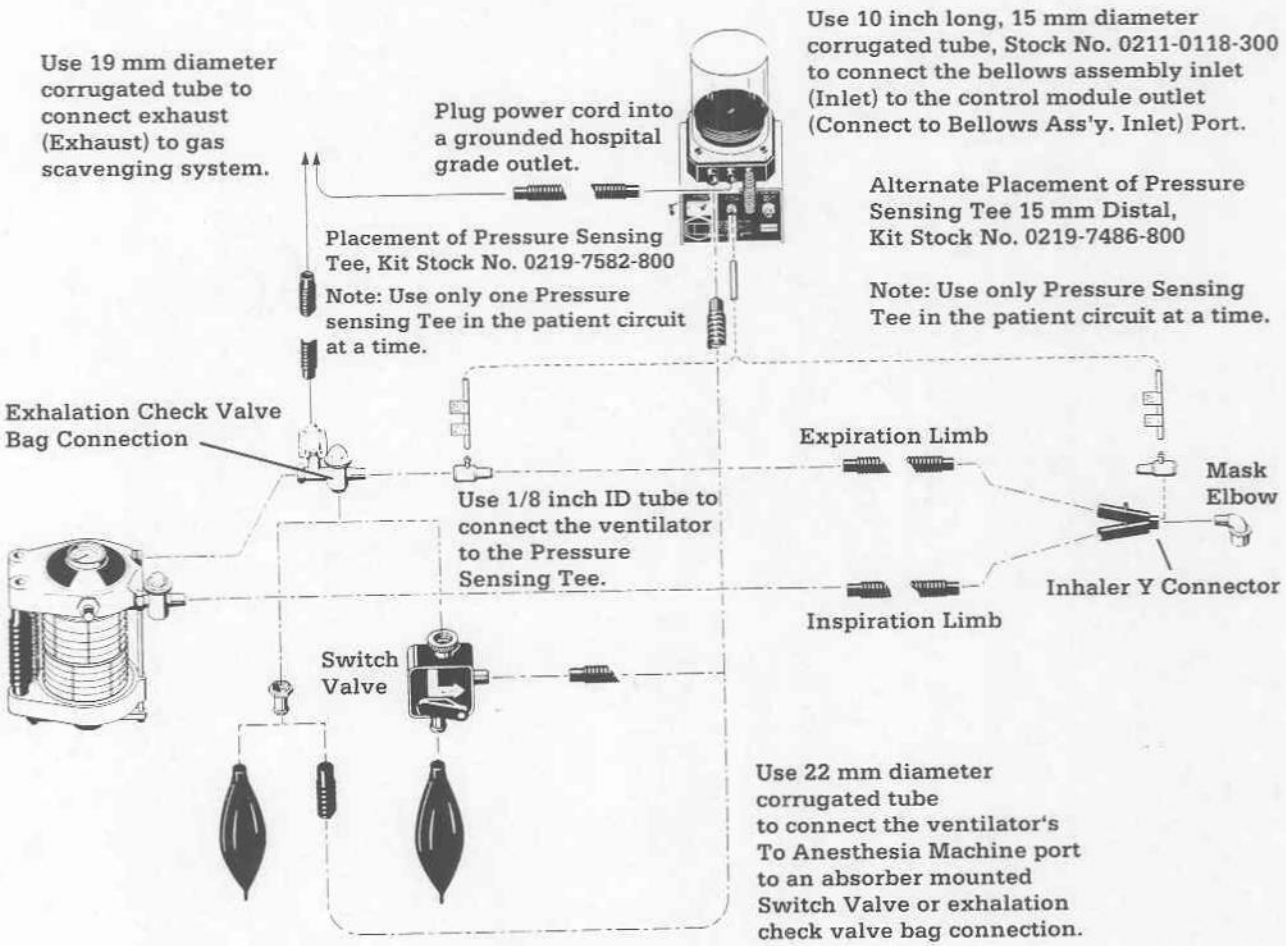

Use 19 mm diameter corrugated tube to connect exhaust (Exhaust) to gas scavenging system.
Plug power cord into a grounded hospital grade outlet.
Use 10 inch long, 15 mm diameter corrugated tube, Stock No. 0211-0118-300 to connect the bellows assembly inlet (Inlet) to the control module outlet (Connect to Bellows Ass'y. Inlet) Port.
Alternate Placement of Pressure Sensing Tee 15 mm Distal, Kit Stock No. 0219-7486-800
Note: Use only Pressure Sensing Tee in the patient circuit at a time.
Placement of Pressure Sensing Tee, Kit Stock No. 0219-7582-800
Note: Use only one Pressure sensing Tee in the patient circuit at a time.
Exhalation Check Valve Bag Connection
Expiration Limb
Mask Elbow
Use 1/8 inch ID tube to connect the ventilator to the Pressure Sensing Tee.
Inhaler Y Connector
Inspiration Limb
Switch Valve
Use 22 mm diameter corrugated tube to connect the ventilator's To Anesthesia Machine port to an absorber mounted Switch Valve or exhalation check valve bag connection.

Figure 8
Bellows Assembly Attached to Control Module - Setup with Ohmeda Model 21 Absorber

With GMS Absorber

Note: This setup is used when the 7000 Electronic Anesthesia Ventilator (with bellows assembly attached) and GMS Absorber are present in the anesthesia system.

See Figure 9.

1. Use the 10 inch long, 15 mm diameter corrugated tube (driving gas tube) to connect the bellows assembly Inlet port to the control module outlet port labeled Connect to Bellows Ass'y. Inlet.
2. Fit one end of the clear 1/8 inch ID pressure sensing tube on the control module's barbed connector labeled Connect to Expiratory limb of Breathing System.
3. Fit the other end of the sensing tube onto the barbed end of the antidisconnect fitting provided with the absorber.
4. Place the nipple of the fitting into the absorber port labeled Expiratory Breathing System Pressure.

   The connections of the pressure sensing tube must be secure or the ventilator's Low Airway Pressure Alarm will sound continuously.

   ⚠WARNING: Proper placement of the pressure sensing tube is very important. The tube must be placed in the expiratory limb of the patient circuit. To insure proper function of the ventilator Low Airway Pressure Alarm, clear accumulated condensate from the pressure sensing tube immediately.
5. Use a 19 mm diameter corrugated tube (not supplied) to connect the bellows assembly Exhaust port to an appropriate gas scavenging system.

   ⚠WARNING: Do not connect the ventilator Exhaust directly to a vacuum source. The vacuum may remove required gases from the patient circuit.
6. Use a 22 mm diameter corrugated tube (not supplied) to connect the To Anesthesia Machine port to the absorber's Ventilator port.
7. Use a suitable high pressure hose (female oxygen DISS fitting at the ventilator end and appropriate connector at the oxygen source) to connect the ventilator inlet (labeled Use Only Oxygen (50 - 70 psig) (345 - 483 kPa) to an oxygen source. An oxygen high pressure hose is not supplied with the ventilator.

   ⚠WARNING: This ventilator is designed to be powered by oxygen only. Using any other gas will cause inaccurate operation and may damage the ventilator, resulting in possible injury to the patient.
8. Plug the power cord into a properly grounded hospital grade outlet. The label on the back panel of the control module indicates the power requirements for operating the unit. The setting for the ac voltage for operating the unit can be found in the window on the power inlet module on the back of the unit.

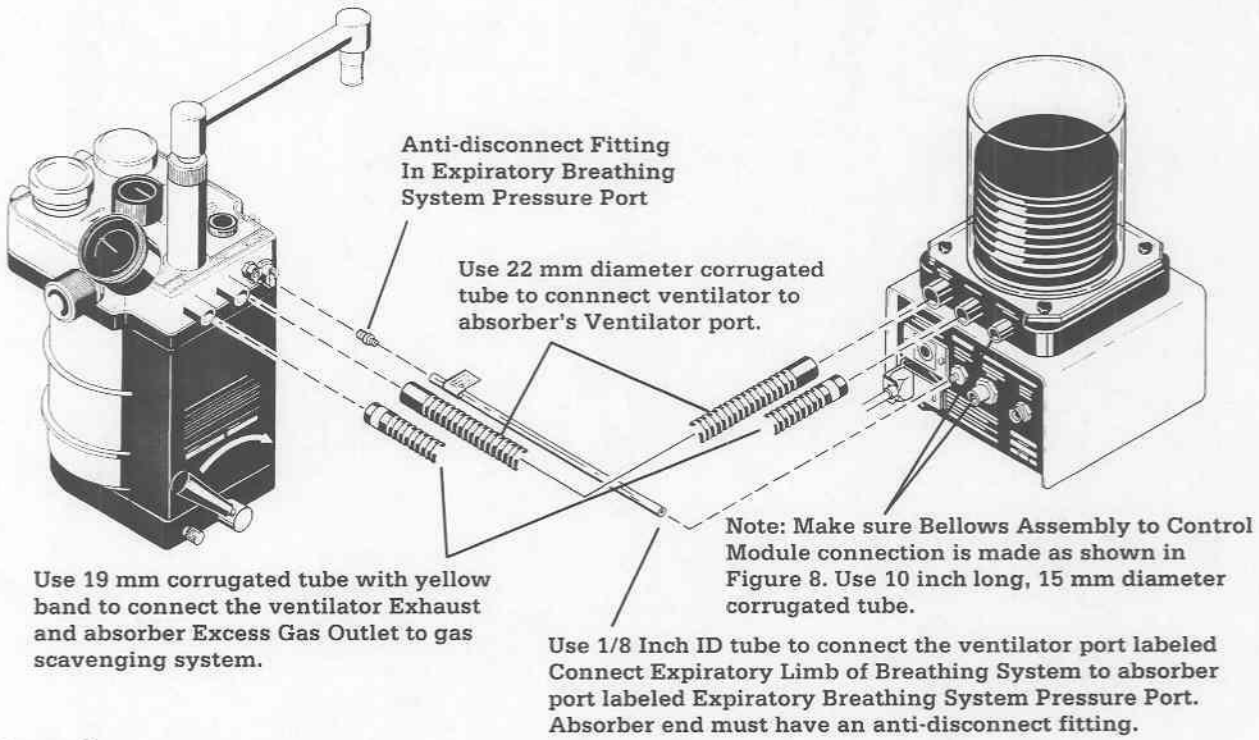

Anti-disconnect Fitting In Expiratory Breathing System Pressure Port
Use 22 mm diameter corrugated tube to connnect ventilator to absorber's Ventilator port.
Note: Make sure Bellows Assembly to Control Module connection is made as shown in Figure 8. Use 10 inch long, 15 mm diameter corrugated tube.
Use 19 mm corrugated tube with yellow band to connect the ventilator Exhaust and absorber Excess Gas Outlet to gas scavenging system.
Use 1/8 Inch ID tube to connect the ventilator port labeled Connect Expiratory Limb of Breathing System to absorber port labeled Expiratory Breathing System Pressure Port. Absorber end must have an anti-disconnect fitting.

Figure 9
Ventilator to GMS Absorber Connections - Without Interface

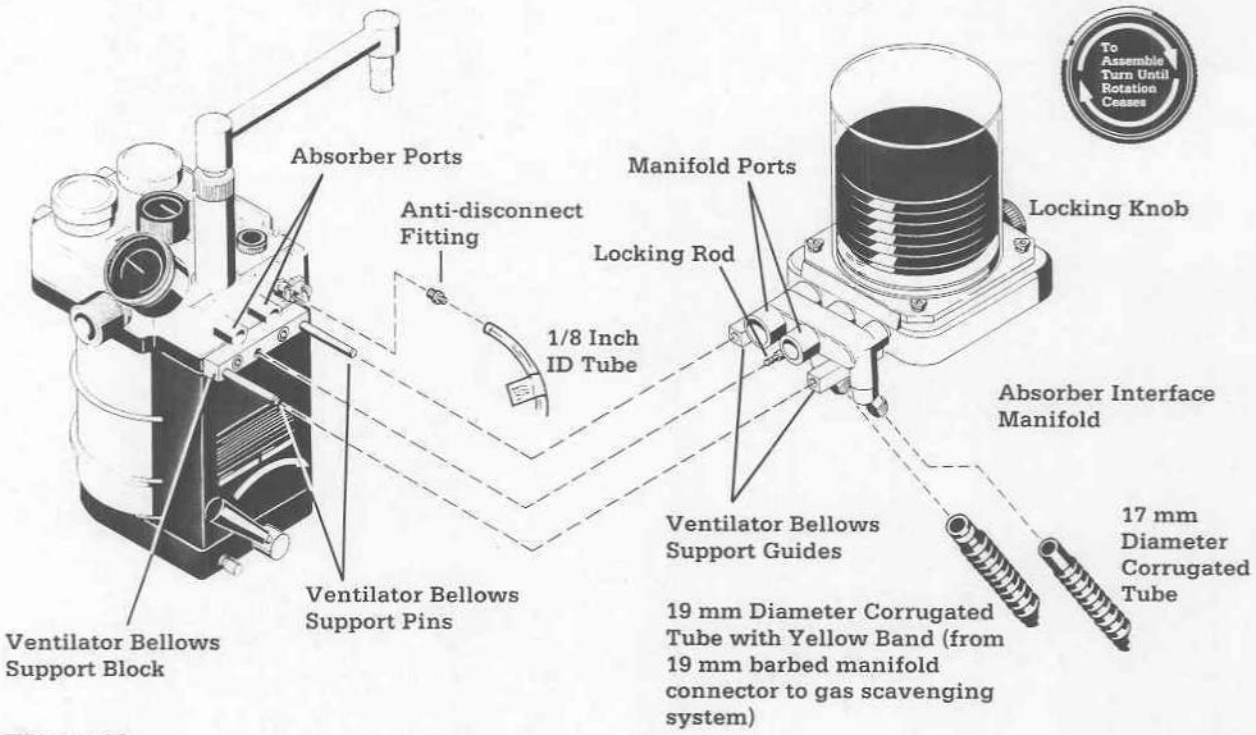

To Assemble Turn Until Rotation Ceases
Absorber Ports
Anti-disconnect Fitting
Manifold Ports
Locking Rod
Locking Knob
1/8 Inch ID Tube
Absorber Interface Manifold
Ventilator Bellows Support Guides
17 mm Diameter Corrugated Tube
Ventilator Bellows Support Pins
Ventilator Bellows Support Block
19 mm Diameter Corrugated Tube with Yellow Band (from 19 mm barbed manifold connector to gas scavenging system)

Figure 10
Interface Manifold Engagement

B. Setup Using Ventilator Bellows to Absorber Interface

In Modulus II Anesthesia Systems with GMS Absorber.

Note: This setup is used only when the ventilator control module is installed above the flow control assembly, the bellows assembly is mounted on the GMS Absorber, and all interface kit (Stock No. 0219- 7518-810) items are present.

To engage the interface manifold:

See Figure 10.

1. Align the two ventilator bellows support guides with the two ventilator bellows support pins.
2. Slide the guides over the pins until the manifold aligns with and touches the absorber ports.
3. Engage the locking rod with the tapped hole in the bellows support block by turning the locking knob clockwise. Continue turning the knob until it stops.

To make control module to interface manifold and absorber connections:

See Figures 10 and 11.

1. Fit the 17 mm diameter corrugated tube onto the 90 degree adapter connected to the ventilator's control module port labeled Connect To Bellows Ass'y Inlet.
2. Slide the free end of the tube through the larger rings of two hanger tabs. Space the tabs on the tube length as shown.
3. Slide the clear 1/8 inch ID pressure sensing tube through the smaller rings of the two hanger tabs.
4. Fit one end of the tube on the ventilator control module's barbed connector labeled Connect To Expiratory Limb of Breathing System.
5. At approximately mid-length, secure the 17 mm diameter corrugated tube to the mounting bracket on the side of the stand as shown in Figure 11.

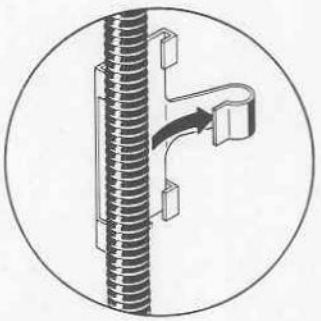


Figure 11
Attaching the 17 mm Diameter Corrugated Tube to the Mounting Bracket

6. Slide the nonsecured length of 1/8" ID pressure sensing tube through the smaller rings of two additional hanger tabs.
7. Fit the open end of this tube onto the barbed end of the antidisconnect fitting provided with the absorber.
8. Place the nipple of the fitting into the absorber port labeled Expiratory Breathing System Pressure.

   The connections of the pressure sensing tube must be secure or the ventilator's Low Airway Pressure Alarm will sound continuously.

   ⚠WARNING: Proper placement of the pressure sensing tube is very important. The tube must be placed in the expiratory limb of the patient circuit. To insure proper function of the ventilator Low Airway Pressure Alarm, clear accumulated condensate from the pressure sensing tube immediately.
9. Slide the 17 mm diameter corrugated tube through the larger rings of the hanger tabs which hold the sensing tube. Space the tabs as shown.
10. Fit the other end of the 17 mm diameter corrugated tubing onto the 17 mm barbed interface manifold connector.
11. Use a length of 19 mm diameter corrugated tubing to connect the remaining (19 mm) barbed interface manifold connector to an appropriate gas scavenging system.

    ⚠WARNING: Do not connect the interface manifold directly to a vacuum source. The vacuum may remove required gases from the patient circuit.
12. Plug the ventilator power cord into one of the outlets on the back panel of the system's electrical pod.
13. Use the special 10 inch long high pressure hose to connect the ventilator control module inlet labeled Use Only Oxygen (50 - 70 psig) (345 - 483 kPa) to the system's power outlet. Position this hose over the other hoses and power cord.

In Other Anesthesia Systems

Note: Use the following procedure only when:

- the ventilator control module is on a shelf or on a mounting bracket

  and
- when the bellows assembly is mounted on the GMS Absorber.

For the Ohmeda Excel Anesthesia System, use interface kit (Stock No. 1001-8907-000).

For other systems use interface kit (Stock No. 0236-0510-800).

To engage the interface manifold:

See Figure 10.

1. Align the two ventilator bellows support guides with the two ventilator bellows support pins.
2. Slide the guides over the pins until the manifold aligns with and touches the absorber ports.
3. Engage the locking rod with the tapped hole in the bellows support block by turning the locking knob clockwise. Continue turning the knob until it stops.

To make control module to interface manifold and absorber connections:

See Figures 10 and 12.

1. Fit the 17 mm diameter corrugated tube onto the 90 degree adapter connected to the ventilator's control module port labeled Connect To Bellows Ass'y Inlet.
2. Slide the free end of the tube through the larger rings of two hanger tabs. Space the tabs on the tube length as shown.
3. Slide the clear 1/8 inch ID pressure sensing tube through the smaller rings of the two hanger tabs.
4. Fit one end of the tube on the ventilator control module's barbed connector labeled Connect To Expiratory Limb of Breathing System.
5. Fit the open end of the pressure sensing tube onto the barbed end of the antidisconnect fitting provided with the absorber.
6. Place the nipple of the fitting into the absorber port labeled Expiratory Breathing System Pressure.

   The connections of the pressure sensing tube must be secure or the ventilator's Low Airway Pressure Alarm will sound continuously.

   ⚠WARNING: Proper placement of the pressure sensing tube is very important. The tube must be placed in the expiratory limb of the patient circuit. To insure proper function of the ventilator Low Airway Pressure Alarm, clear accumulated condensate from the pressure sensing tube immediately.

7. Fit the other end of the 17 mm diameter corrugated tubing onto the 17 mm barbed interface manifold connector.
8. Use a length of 19 mm diameter corrugated tubing to connect the remaining (19 mm) barbed interface manifold connector to an appropriate gas scavenging system.

   ⚠WARNING: Do not connect the interface manifold directly to a vacuum source. The vacuum may remove required gases from the patient circuit.
9. Use a suitable high pressure hose (female oxygen DISS fitting at the ventilator end and appropriate connector at the oxygen source) to connect the ventilator inlet (labeled Use Only Oxygen (50 - 70 psig) (345 - 483 kPa) to an oxygen source.

   An oxygen high pressure hose is not supplied with the ventilator.

   ⚠WARNING: This ventilator is designed to be powered by oxygen only. Using any other gas will cause inaccurate operation and may damage the ventilator, resulting in possible injury to the patient.
10. Plug the power cord into a properly grounded hospital grade outlet. The label on the back panel of the control module indicates the power requirements for operating the unit. The setting for the ac voltage for operating the unit can be found in the window on the power inlet module on the back of the unit.

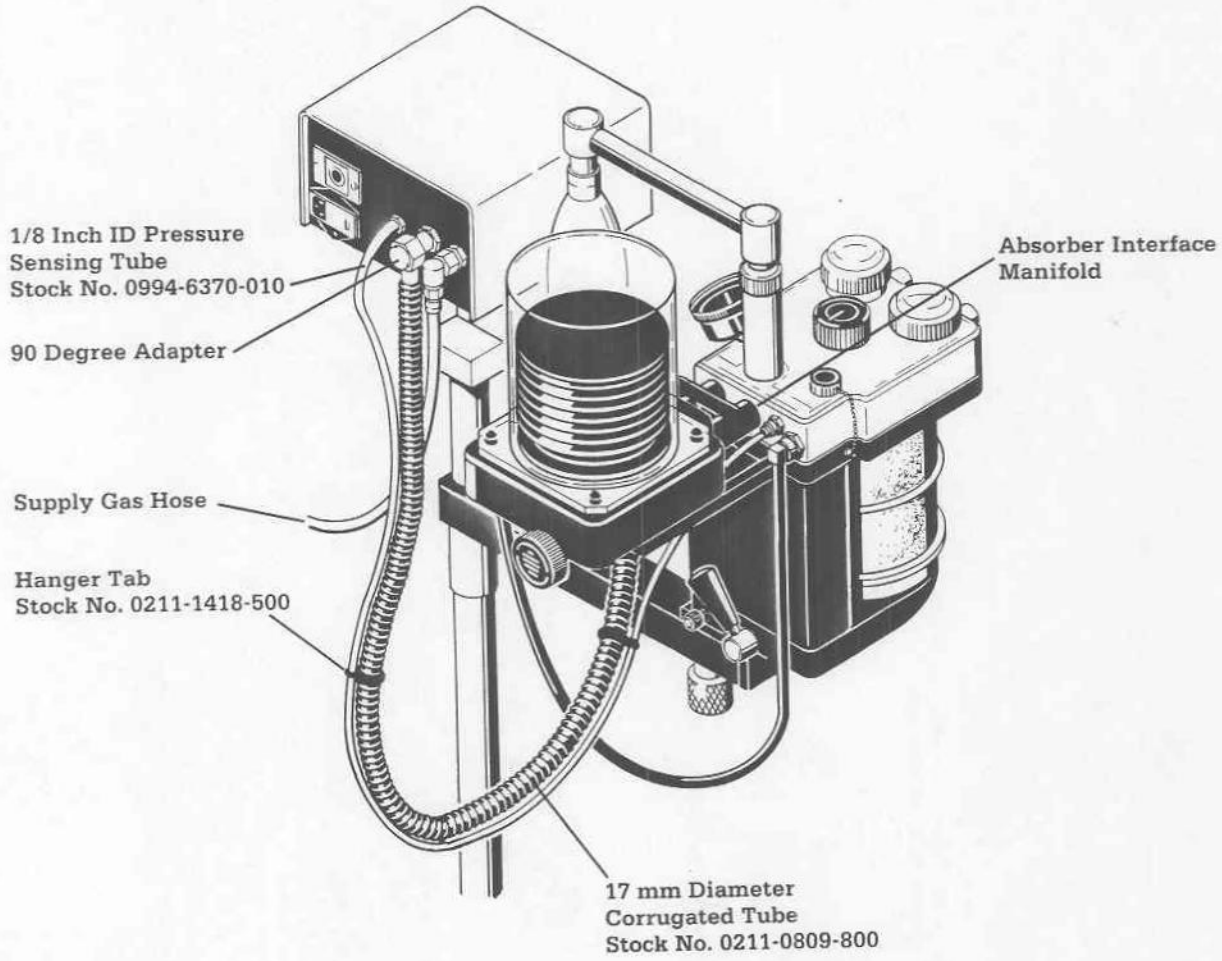

1/8 Inch ID Pressure Sensing Tube Stock No. 0994-6370-010
90 Degree Adapter
Supply Gas Hose
Hanger Tab Stock No. 0211-1418-500
Absorber Interface Manifold
17 mm Diameter Corrugated Tube Stock No. 0211-0809-800

Figure 12
Control Module to Interface Connections - Other Anesthesia Systems

2.3 Preoperative Checkout Procedures

⚠WARNING: Do not use the ventilator until all the Preoperative Checkout Procedures have been performed and correct operation has been verified. Perform these procedures before each case.

1. Verify that the proper hose connections have been made between the bellows assembly and the control module.
2. Verify that the proper hose connections have been made between the bellows assembly and the patient breathing circuit.
3. Verify that the correct driving gas (Oxygen Only) is securely connected to the control module.
4. Verify that the electrical power cord is plugged into a properly grounded outlet.
5. Verify that a properly functioning scavenging system is connected to the ventilator's 19 mm Exhaust port or interface manifold 19 mm connector. Do not connect the ventilator Exhaust directly to a vacuum source.
6. Verify that the alarm lamps light and alarm tone sounds when the Lamp Test button is pressed (The Power Switch must be On (I). If not, do not use the ventilator and have an Ohmeda Service Representative make repairs.
7. Verify that the Sigh Switch is in the desired position.
8. Verify that the low airway pressure sensing tube is properly connected to the barb on the control module back panel labeled Connect To Expiratory Limb of Breathing System and to the pressure sensing tee (or Expiratory Breathing System Pressure fitting secured in the GMS Absorber).
9. Verify that the Low Airway Pressure Alarm and high pressure relief are functioning by doing the following:
   a. Fit a rebreathing bag onto the Y connector.
   b. Fill the bellows using the anesthesia system's oxygen flush and set a gas flow of 2 L/min. Keep the bellows inflated.
   c. Switch the ventilator on.
   d. Set ventilator control dials so that no alarms activate.
   e. Remove the bag from the Y connector. The Low Airway Pressure Alarm should activate after the second ventilation cycle. If not, do not use the ventilator and have an Ohmeda Service Representative make repairs. If the alarm is functional, continue with step f.
   f. Keep the ventilator cycling and set the control dials for a tidal volume of 1 liter.
   g. Plug the Y connector.
   h. During the next inspiration phase, the Set Volume Not Delivered Alarm should activate and the bellows should reinflate before the 1 liter tidal volume is reached. If not, do not use the ventilator and have an Ohmeda Service Representative make repairs.

Note: An abbreviated version of these procedures is printed on the Preoperative Check List card which slides out from under the control module. Its purpose is to remind the operator of the checks which must be made, not to give instruction. To learn safe operation of the ventilator, read this entire manual.

2.4 Bellows Assembly Leak Test

Do the following before each case.

1. Perform the leak test recommended for the absorber in use (consult the absorber operation and maintenance manual). The absorber must pass the leak test before performing the following steps.
2. Shut off all fresh gas flow.
3. Plug the Y connector.
4. Fill the bellows using the anesthesia system's oxygen flush.
5. Observe the bellows. If it drops more than 100 mL in one minute, it has a leak. Tighten loose patient circuit connections, then repeat the test. If the leak cannot be corrected, do not use the ventilator and have an Ohmeda Service Representative make repairs.

   ⚠WARNING: Do not use the ventilator if it fails any part of the checkout procedure. Remove for service.

2.5 To Begin Operation

⚠WARNING: Do not use the ventilator until all the Preoperative Checkout Procedures have been performed and correct operation has been verified.

1. Set the desired values for Minute Volume, Rate and I:E Ratio on the control dials.
2. With the Power Switch Off (O), use the anesthesia system's oxygen flush valve to fill the bellows. Maintain an oxygen flow which is sufficient to keep the bellows fully extended.

   Note: It is important to perform Step 2 prior to turning the ventilator on. This will insure proper bellows operation.
3. Switch the Power On (I).
4. Compare the ventilator Minute Volume setting to the volume monitor setting as described in Section 1.2 C. Make appropriate control dial adjustments.

   Note: The ventilator has a nonadjustable pressure limiting valve set to approximately 65 cm H_2O. This valve will begin to relieve when driving gas pressure rises above 65 cm H_2O.

   If patient circuit gas pressure, as detected at the pressure sensing tee, exceeds 65 to 75 cm H_2O, a pressure switch opens the driving gas exhaust valve and exhausts the remainder of the inspiration phase driving gas to atmosphere. A high pressure condition activates the **Set Volume Not Delivered** Alarm. If the high pressure condition continues without relief throughout two to three consecutive cycles, the **Ventilator Failure** Alarm activates, and the ventilator stops cycling.

2.6 To End Operation

1. When mechanical ventilation is no longer required from the 7000 ventilator, the Power Switch may be switched to the Off (O) position.

⚠WARNING: Fire Hazard - Never oil or grease any anesthesia or oxygen equipment. In general, oils and greases oxidize readily and in the presence of oxygen, they will burn violently.

3.1 Repair Policy and Procedure

Do not use malfunctioning equipment. Make all necessary repairs, or have the equipment serviced by an authorized Ohmeda Representative. After repair, test the equipment to ensure that it is functioning properly, in accordance with the manufacturer's published specifications.

To ensure full reliability, have all repairs and service done by an authorized Ohmeda Representative. If this cannot be done, replacement and maintenance of those parts listed in this manual may be undertaken by a competent, trained individual having experience in the repair of Ohmeda 7000 Electronic Anesthesia Ventilators and having appropriate test and calibration equipment.

⚠CAUTION: No repair should ever be undertaken or attempted by anyone not having proper qualifications and equipment.

Replace damaged parts with components manufactured or sold by Ohmeda. Then test the unit to ascertain that it complies with the manufacturer's published specifications.

Note: In some cases, special diagnostic equipment may be required to properly service the Ohmeda 7000 Electronic Anesthesia Ventilator. The unit must then be sent to the nearest Ohmeda Service Center.

Contact the nearest Ohmeda Service Center for service assistance. If you send the unit to an Ohmeda Service Center, package it securely in the original shipping container, if possible, and ship it prepaid. Enclose a letter with the unit describing in detail any difficulties experienced and the repairs felt necessary. In all cases, other than where Ohmeda's warranty is applicable, repairs will be made at Ohmeda's current list price for the replacement part(s) plus a reasonable labor charge.

3.2 Cleaning and Sterilizing the Bellows Assembly

⚠WARNING: Sterilize the bellows assembly periodically to minimize the risk of cross-infecting patients. Use a sterilization schedule that complies with your institution's infection-control and risk-management policies. Use Ohmeda-approved sterilization methods.

⚠CAUTION: Perform the Preoperative Checkout Procedure after cleaning and sterilizing the bellows assembly.

The temperature difference between exhaled patient gases and the room environment can cause water droplets to form in the breathing system. This droplet formation, which is normal, will be particularly noticeable in the bellows and bellows base.

Periodically clean and sterilize the bellows assembly to reduce the risk of cross-infection and to help keep the ventilator working properly.

The bellows is an expendable item. Replace the bellows periodically or when it shows any sign of damage.

Disassembly

Be sure to unplug the power cord and remove all hose connections before dismantling the bellows assembly.

To disassemble the bellows assembly:

Perform step 1 if the bellows assembly is attached to the control module.

Perform step 2 if the bellows assembly is attached to the GMS Absorber.

1. To detach the bellows assembly from the control module:
   a. Remove the the four thumbscrews which attach the bellows assembly.
   b. Carefully lift the bellows assembly from the control module.
2. To detach the bellows assembly from the Ohmeda GMS Absorber:
   a. Disconnect tubing from ventilator base.
   b. Turn the locking knob counterclockwise until the locking rod releases.
   c. Hold the entire assembly firmly and slide the support guides off the support pins.
   d. Remove the four thumbscrews that attach the bellows assembly to the mounting assembly. Then lift the bellows assembly from the mounting assembly.
   e. Remove the interface manifold from the bellows assembly port.
3. For further cleaning or sterilization, use Figure 13 and 14 as a guide to disassemble and reassemble the bellows assembly .

   Before reassembling the bellows assembly, check all of the rubber parts—including the bellows—for swelling, tackiness, holes, cracking, or any other signs of damage. Rubber devices, which deteriorate, are expendable items and must be replaced periodically.

Cleaning

To clean the bellows housing, bellows, pressure-sensing tube, pop-off valve, bellows base, and interface manifold:

1. Wash the bellows housing in a mild soap-and-water solution. Use cold water to thoroughly rinse the housing of all soap. Dry the housing with a soft, lint-free cloth.

2. Wash the bellows (and—in the pediatric bellows only—the base and ring) in a mild soap-and-water solution. Use cold water to thoroughly rinse the bellows of all soap. Remove excess water from the bellows, then hang the bellows, suspended by its top disk, to dry for at least 12 hours.

   The bellows must be allowed to dry completely; moisture remaining in the folds of the bellows may make the bellows tacky, which will cause the bellows to operate improperly.

3. Wash the pressure-sensing tube with a mild soap-and-water solution. Use cold water to thoroughly rinse the tube of all soap. Remove all soap and water from inside the tube. Dry the tube thoroughly.

4. Do not immerse the pop-off valve in liquid. Immersion can trap liquids in the valve, which will impair the valve's performance.

   Clean the valve's exterior surfaces with a soft cloth dampened with a solution of warm water and mild, liquid detergent. Do not allow liquid to enter the drive-gas port (see Figure 14).

   Dampen a clean, soft cloth in cold water and use the cloth to wipe the valve clean. Let the valve dry completely before using or sterilizing.

   ⚠CAUTION: Do not disassemble the pop-off valve.

5. Do not immerse the bellows base in liquid. Immersion can trap liquids in the driving gas circuit of the base, which will impair the bellows assembly's performance.

   Clean the base's exterior surfaces with a soft cloth dampened by a solution of warm water and mild, liquid detergent. Do not allow the liquid to enter the drive-gas ports (see Figure 14).

   The 17-mm "Inlet" (driving gas) port is normally exposed to only oxygen and shouldn't need cleaning.

   A bottle brush may be used to clean the ports labeled "To Anesthesia Machine" and "Exhaust."

   Use a clean cloth or bottle brush dampened in cold water to remove all traces of soap from the bellows base. Let the base dry completely before either use or sterilization.

   ⚠WARNING: Liquids or any foreign materials trapped in the driving-gas circuit of the pop-off valve or the bellows base can impair the valve's operation. Do not use the pop-off valve or the bellows base if you suspect that materials are trapped. Have the assembly repaired by trained service personnel.

6. Wash the interface manifold with a mild soap-and-water solution. Use cold water to thoroughly rinse the manifold of all soap. Dry the interface manifold thoroughly.

7. Before reassembling the bellows assembly, check all of the rubber parts—including the bellows—for swelling, tackiness, holes, cracking, or any other signs of damage. Rubber devices, which deteriorate, are expendable items and must be replaced periodically.

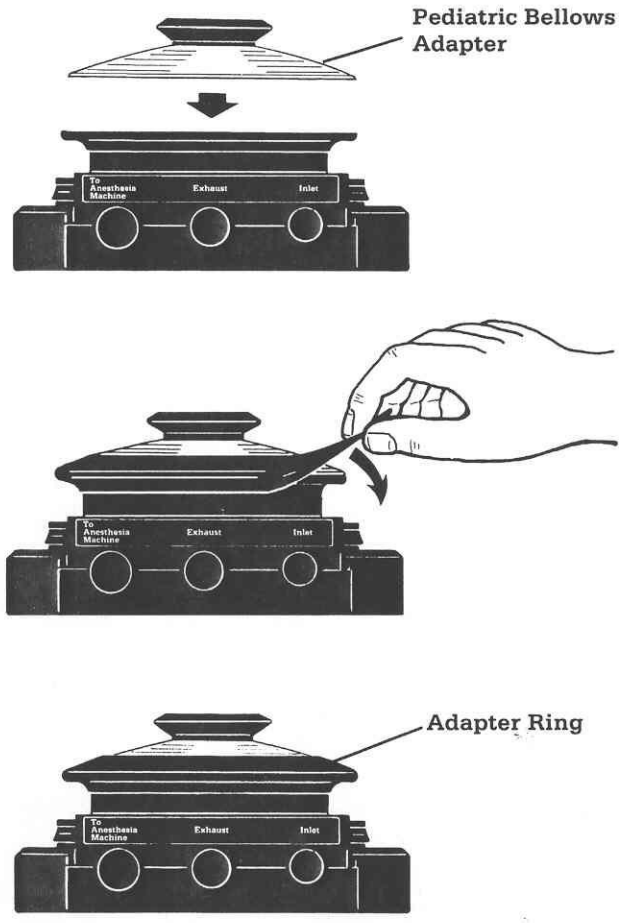


Figure 13
Connecting the Pediatric Bellows Adapter to the Bellows Base

Sterilizing

To sterilize the bellows housing, bellows, pop-off valve, pressure-sensing tube, bellows base, and interface manifold:

1. Wash and completely dry the components as described in the previous steps.
2. The above listed components may be sterilized using an ethylene oxide mixture at 52 to 57°C (125 to 135°F), or room temperature sterilization with 100% ethylene oxide. Follow the sterilizer manufacturer's recommendations for aeration periods required.

Because the bellows exteriors are normally exposed only to driving gas, the adult and pediatric bellows housings require sterilization only if the bellows has torn or leaked.

⚠WARNING: Following ethylene oxide sterilization, quarantine the equipment in a well-ventilated area to allow dissipation of absorbed ethylene-oxide gas. In some cases, aeration periods of seven days or more may be required. Aeration time can be decreased when special aeration devices are used. Follow the sterilizer manufacturer's recommendations for aeration periods required.

3.3 Replaceable Parts

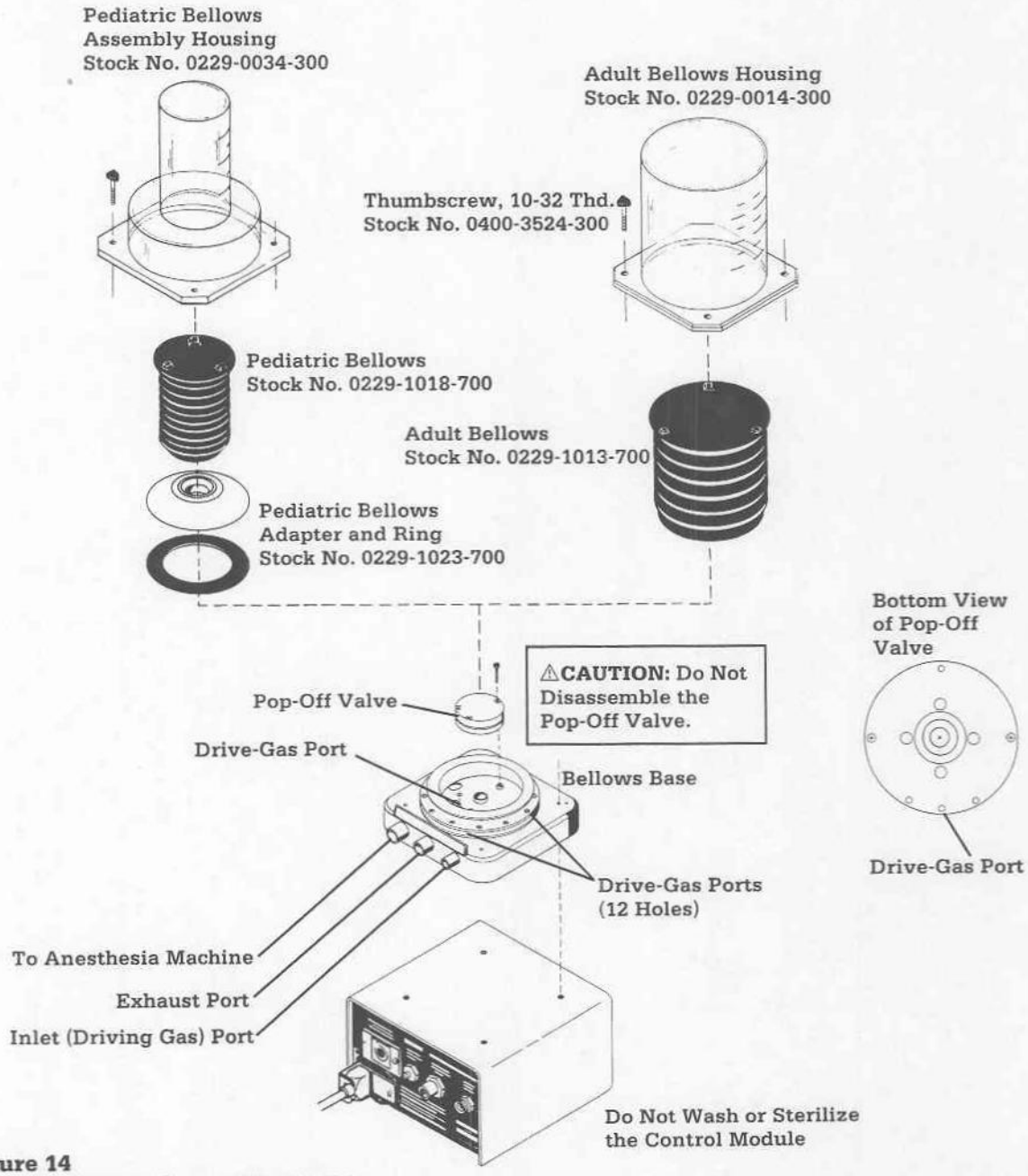


Figure 14
Bellows Disassembly and Replaceable Parts

3.4 Instructions for Changing the Input Voltage

1. Unplug the power cord from the mains receptacle.
2. Use Figure 15 as a guide. On the back of the unit, remove the anti-disconnect bracket by removing the two socket head cap screws.
3. Remove the power cord plug from the power inlet module.
4. Use Figure 16 as a guide. Place the end of a small flat-edge screwdriver into the tab on the right side of the power inlet module and pry open the cover. Completely open the cover of the module.
5. Remove the voltage selector drum and rotate the drum so that the desired voltage faces forward.
6. Reinsert the drum into the slots in the module. Close the cover and push firmly to snap the module cover into place.
7. Check to insure that the appropriate voltage is displayed in the window.
8. Reinstall the power cord and the power cord anti-disconnect bracket.
9. If the power cord plug is not of the proper configuration for the mains receptacle, contact Ohmeda Service.

⚠CAUTION: The input voltage to the ventilator from the mains outlet must be the same as that indicated in the window on the power inlet module on the rear panel of the control module. Operating the ventilator with an incorrect input voltage may damage the ventilator or cause it to malfunction.

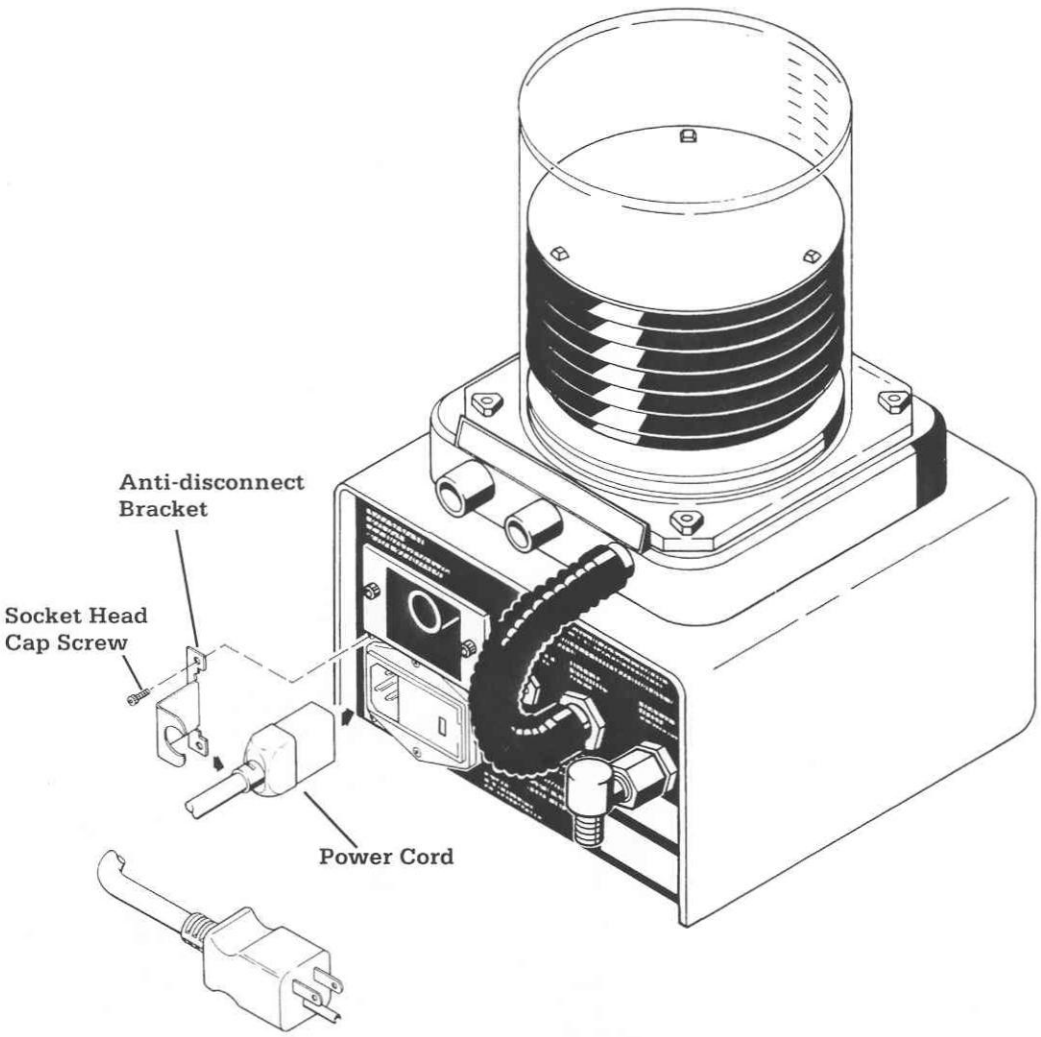


Figure 15
Anti-Disconnect Bracket Removal

3.5 Instructions for Changing the Fuses

1. Unplug the power cord from the mains receptacle.
2. Use Figure 15 as a guide. On the back of the unit, remove the anti-disconnect bracket by removing the two socket head cap screws.
3. Remove the power cord plug from the power inlet module.
4. Use Figure 17 as a guide. Place the end of a small flat-edge screwdriver into the tab on the right side of the power inlet module and pry open the cover. Completely open the cover of the module.
5. Use the end of the screwdriver to lift out the fuse drawer.
6. Replace the fuse with a fuse of the same correct type and rating.
7. Slide the drawer with the new fuse back into the power inlet module with the arrow pointing down.
8. Repeat steps five through six for the other fuse.
9. Check the voltage selector drum to verify that the desired voltage is facing forward. Close the cover and push firmly to snap the module cover into place.
10. Check to insure that the appropriate voltage is displayed in the window.
11. Reinstall the power cord and the power cord anti-disconnect bracket.

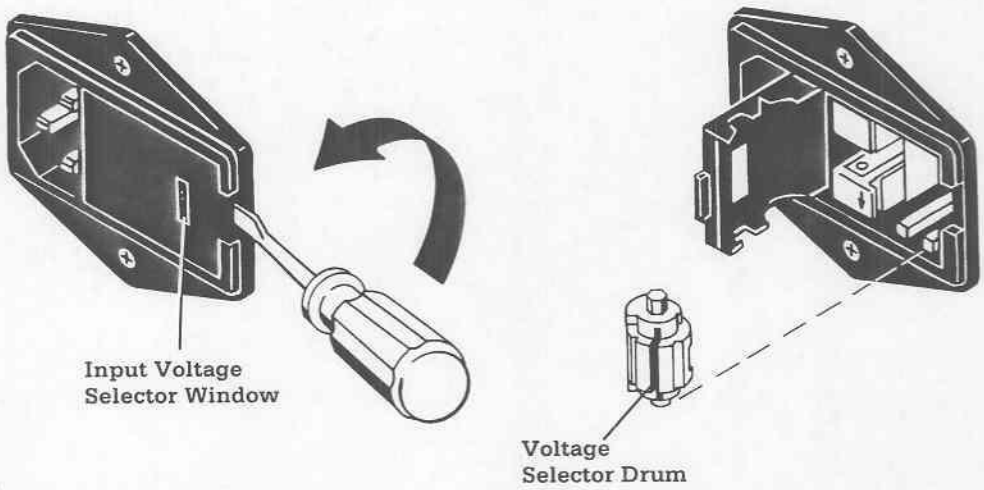


Figure 16
Changing the Input Voltage

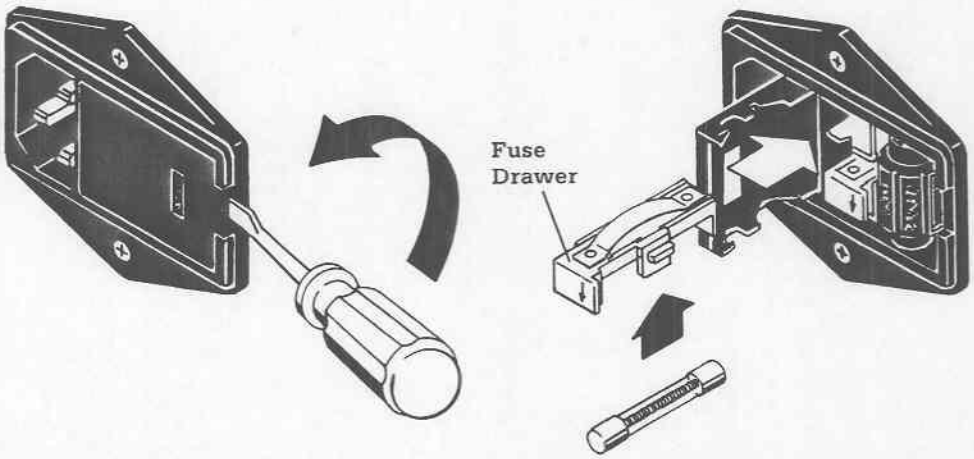


Figure 17
Changing the Fuses

4/Troubleshooting Guide

This troubleshooting guide is intended to help isolate the cause of the most basic problems only. If after using this guide, the ventilator continues to malfunction, an Ohmeda Service Representative should be called to repair the unit.

Problem	Probable Cause	Check
Bellows does not expand during ventilation or tends to collapse.	Leak in the breathing circuit.	Check breathing circuit hoses and connections.
	Bellows not installed properly	Check bellows to base attachment.
	Tear or leak in bellows.	Check the entire surface of the bellows. Pay close attention to the angles in the convolutions.
	Insufficient fresh gas flow.	Check that settings on flow meters are adequate.
Bellows distended and/or slips off the base.	Incorrect scavenging system pressure.	Check the scavenging system for vacuum or high pressure.
Audible Power Failure Alarm sounds after switching Power On (I).	Power cord disconnect or power failure.	Check that the power cord is plugged in. Make sure the outlet has power.
Ventilator cycles normally but Low Airway Pressure Alarm activates.	The pressure sensing tube is disconnected, plugged or kinked.	Check the connections at the control module and at the sensing tee or fitting.
Set Volume Not Delivered Alarm activates.	The Minute Volume and/or Rate dials are set to exceed ventilator function limits.	Check the Minute Volume and Rate dial settings. Make sure they allowfunction within the ventilator limits. See Section 1.3.C.
	High pressure in patient circuit.	Check patient circuit for obstruction.
Low Oxygen Supply Pressure Alarm activates.	High pressure hose connections may be leaking.	Check high pressure hose connections at ventilator and oxygen source.
	Anesthesia system power outlet circuit pressure may be low.	Check pressure in power outlet circuit.
	Hospital oxygen pipeline supply pressure may be low.	Check pressure of hospital oxygen pipeline supply.
	Flow restriction in the gas supply line.	Check supply line hose for restrictions.
Actual I:E Ratio Less Than Dial Setting Alarm activates.	The Minute Volume and I:E Ratio dials are set to exceed ventilator functional limits.	Check the Minute Volume and I:E Ratio dial settings. Make sure they allow function within the ventilator limits. See Section 1.3.C.
Ventilator Failure Alarm activates.	High pressure condition in patient circuit.	Check patient circuit for obstruction.
	Failure in critical area of control module.	Remove ventilator from service for repair.

Warranty

This Product is sold by Ohmeda under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this Product directly from Ohmeda or Ohmeda's Authorized Dealers as new merchandise and are extended to the first Buyer thereof, other than for purpose of resale.

For a period of twelve (12) months from the date of original delivery to Buyer or to Buyer's order, but in no event for a period of more than two years from the date of original delivery by Ohmeda to an Ohmeda Authorized Dealer, this Product, other than its expendable parts, is warranted to be free from functional defects in materials and workmanship and to conform to the description of the Product contained in this operation manual and accompanying labels and/or inserts, provided that the same is properly operated under conditions of normal use, that regular periodic maintenance and service is performed and that replacements and repairs are made in accordance with the instructions provided. This same warranty is made for a period of thirty (30) days with respect to the expendable parts. The foregoing warranties shall not apply if the Product has been repaired other than by Ohmeda or in accordance with written instructions provided by Ohmeda, or altered by anyone other than Ohmeda, or if the Product has been subject to abuse, misuse, negligence, or accident.

Ohmeda's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at Ohmeda's option, a Product, which is telephonically reported to the nearest Ohmeda Regional Service Office and which, if so advised by Ohmeda, is thereafter returned with a statement of the observed deficiency, not later than seven (7) days after the expiration date of the applicable warranty, to the designated Ohmeda Service Office during normal business hours, transportation charges prepaid, and which, upon Ohmeda's examination, is found not to conform with the above warranties. Ohmeda *shall not be otherwise liable for any damages including but not limited to incidental damages, consequential damages, or special damages.*

There are no express or implied warranties which extend beyond the warranties hereinabove set forth. Ohmeda *makes no warranty of merchantability or fitness for a particular purpose with respect to the product or parts thereof.*

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Military Addendum to the:

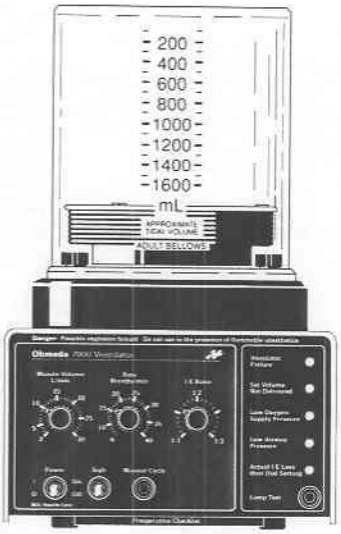
Ohmeda 7000 Anesthesia Ventilator

(Multi-Voltage Electronic)

Operation and Maintenance Manual:

Ohmeda Stock Number 1502-0008-000

Date code 07 90 0



Note: All stock numbers provided in this addendum and in the Operation and Maintenance and Service Manuals are Ohmeda stock numbers.

This addendum provides storage and preventive maintenance information.

WARNING: Do not attempt to operate the ventilator until the Operation and Maintenance manual has been read in its entirety.

WARNING: Danger - Possible explosion hazard if the unit is used in the presence of flammable anesthetics.

WARNING: This ventilator is designed to be powered by oxygen. Medically pure air may be used to power the ventilator. When medically pure air is used, the ventilator's Minute Volume output will be slightly higher than the control setting. The difference in output from the setting will vary from approximately 10% higher at the 2 L/min Minute Volume setting to approximately 5% higher at the 30 L/min Minute Volume setting.

WARNING: Before assembly, the following manuals should be read:

1.	Bag to Ventilator Switch Valve Operation and Maintenance Manual	Ohmeda stock number 0397-2112-164
2.	PEEP Valve Operation and Maintenance Manual	Ohmeda stock number 0397-2112-161
3.	7000 Anesthesia Ventilator (Multi-voltage Electronic) Operation and Maintenance Manual	Ohmeda stock number 1502-0008-000

Short term storage requirements (less than 6 months)

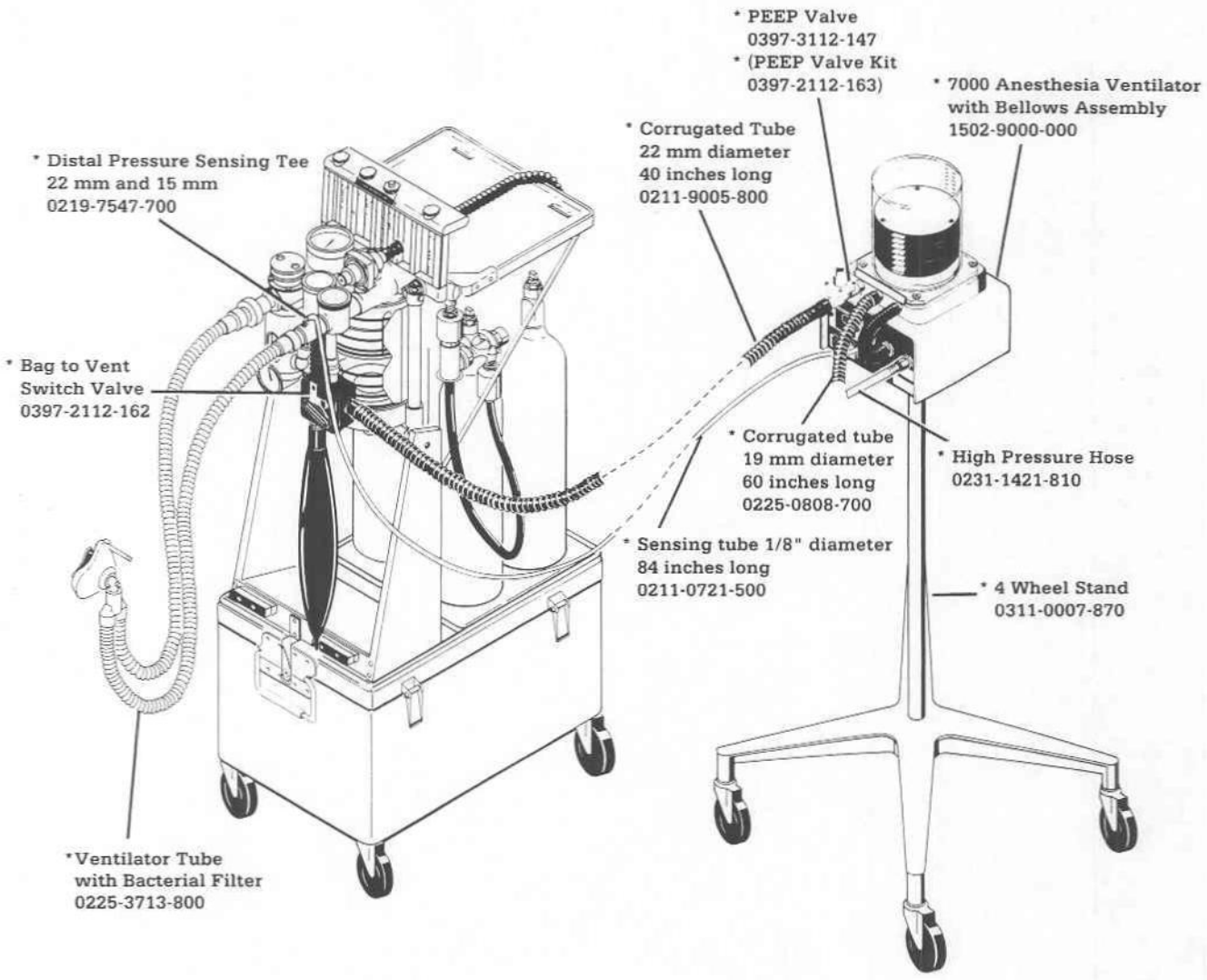
1. Indoor storage only.
2. Non-corrosive environment.
3. Storage temperature between -56.7 and 65.6 °C (-70 and 150 °F).
4. Relative humidity 0 to 100% non-condensing.
5. After short term storage, the periodic maintenance and inspection procedure must be performed before the ventilator is placed into service. Refer to the Service Manual and the Service Manual Addendum for maintenance procedures.

Long term storage requirements (greater than 6 months)

1. Indoor storage only.
2. Non-corrosive environment.
3. Storage temperature between -56.7 and 65.6 °C (-70 and 150 °F).
4. Absolute humidity must not exceed 13 grains per cubic foot.
5. After long term storage, the annual maintenance and inspection procedure must be performed before the ventilator is placed into service. Refer to the Service Manual and the Service Manual Addendum for maintenance procedures.

Preventive maintenance

Preventive maintenance should be performed at quarterly and annual intervals on ventilators in use. See the 7000 Anesthesia Ventilator (Multi-Voltage Electronic) Service Manual (Ohmeda stock number 1502-0009-000) and the 7000 Anesthesia Ventilator (Multi-Voltage Electronic) Service Manual Addendum (Ohmeda stock number 0397-2130-063) for the Maintenance and Inspection Procedure.



* Items designated with an asterisk (*) are included under NSN 6515-01-204-2663

Figure 1 Typical setup with 885A Field Anesthesia Machine

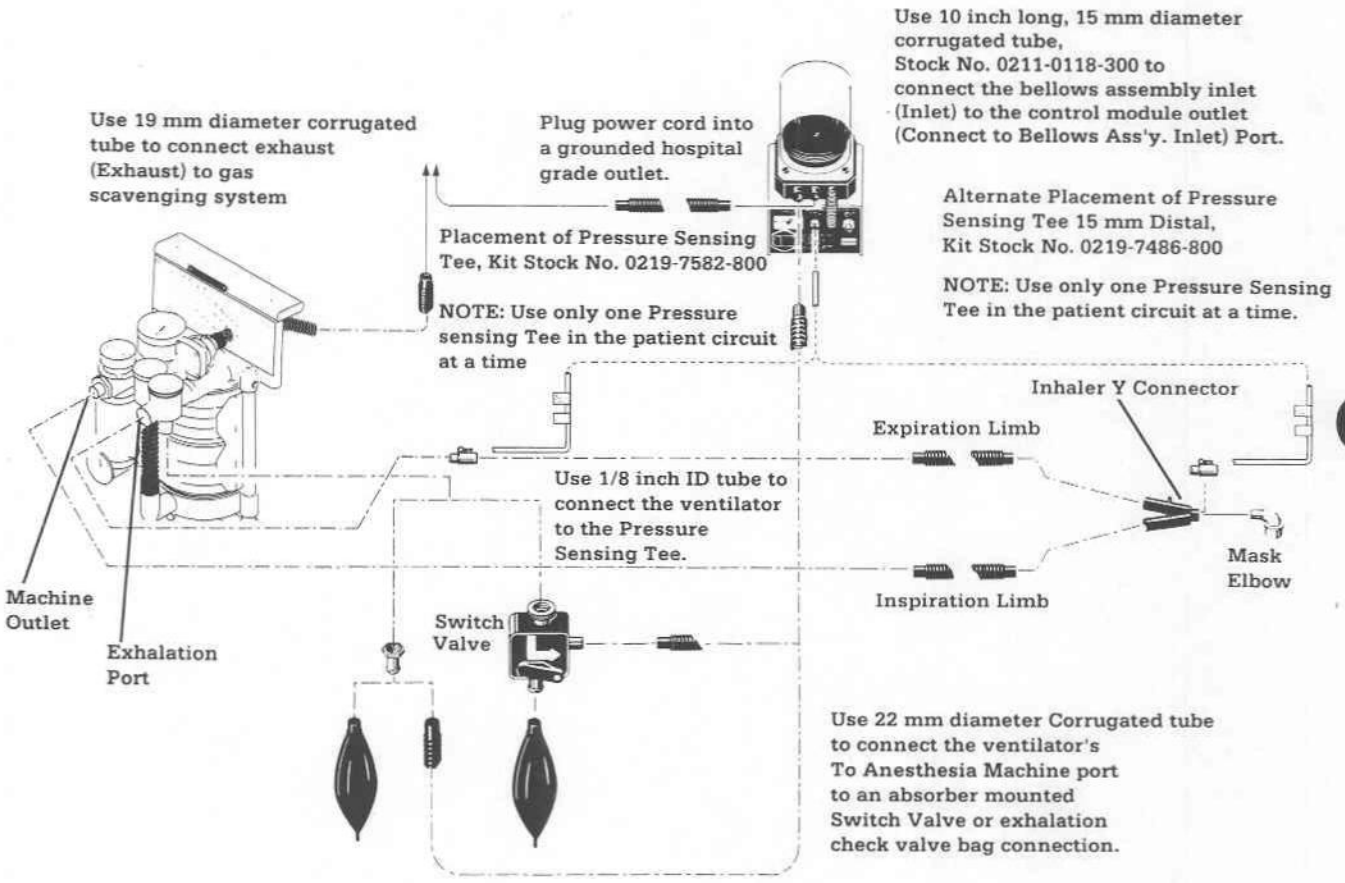

Use 10 inch long, 15 mm diameter corrugated tube, Stock No. 0211-0118-300 to connect the bellows assembly inlet (Inlet) to the control module outlet (Connect to Bellows Ass'y. Inlet) Port.
Use 19 mm diameter corrugated tube to connect exhaust (Exhaust) to gas scavenging system
Plug power cord into a grounded hospital grade outlet.
Alternate Placement of Pressure Sensing Tee 15 mm Distal, Kit Stock No. 0219-7486-800
NOTE: Use only one Pressure Sensing Tee in the patient circuit at a time.
Placement of Pressure Sensing Tee, Kit Stock No. 0219-7582-800
NOTE: Use only one Pressure sensing Tee in the patient circuit at a time
Inhaler Y Connector
Expiration Limb
Use 1/8 inch ID tube to connect the ventilator to the Pressure Sensing Tee.
Mask Elbow
Machine Outlet
Exhalation Port
Switch Valve
Inspiration Limb
Use 22 mm diameter Corrugated tube to connect the ventilator's To Anesthesia Machine port to an absorber mounted Switch Valve or exhalation check valve bag connection.

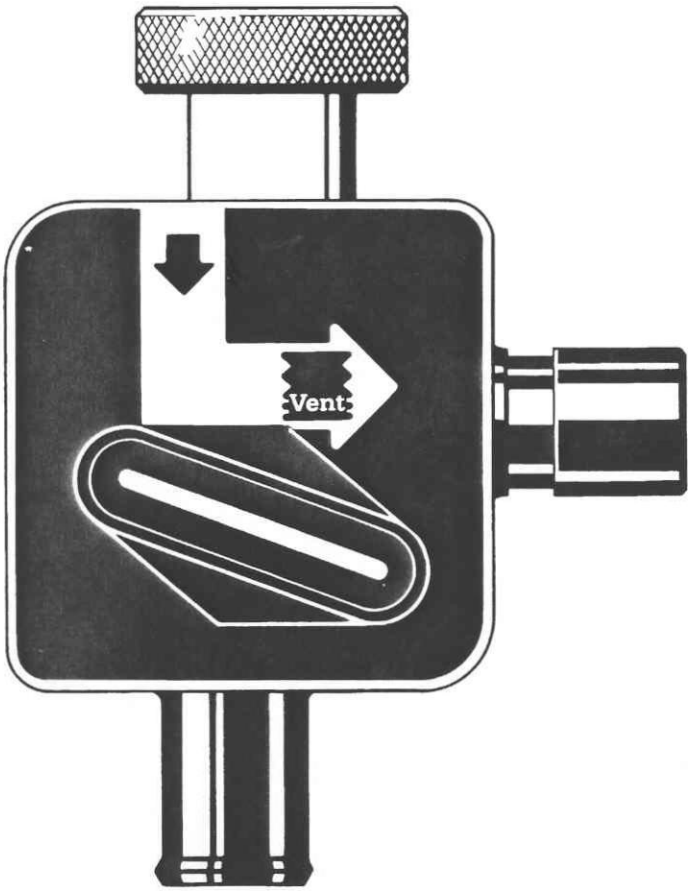
Figure 2 Bellows assembly attached to Control Module with 885A Field Anesthesia Machine

Ohmeda

Bag to Ventilator Switch Valve

For use with 885A Field Anesthesia Machine

Operation and Maintenance Manual



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User Responsibility

Read this manual before operating the equipment. Pay special attention to all Warnings and Cautions.

This Product will perform in conformity with the description thereof contained in this operating manual and accompanying labels and/or inserts, when assembled, operated, maintained and repaired in accordance with instructions provided. This Product must be checked periodically. A defective Product should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, Ohmeda recommends that a telephonic or written request for service advice be made to the nearest Ohmeda Regional Service Office. This Product or any of its parts should not be repaired other than in accordance with written instructions provided by Ohmeda and by Ohmeda trained personnel. The Product must not be altered without the prior written approval of Ohmeda's Safety Department. The user of this Product shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, improper repair, damage, or alteration by anyone other than Ohmeda.

CAUTION: Federal law in the USA and Canada restricts this device to sale by or on the order of a licensed medical practitioner.

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Figure 10 - Vent Position Leak Test with Test Plug on Vent Port 5-6

Precautions

As used in this manual, a Warning indicates a potentially life threatening situation.

Warnings

The Bag to Ventilator Switch Valve must be correctly oriented in the breathing circuit as indicated by the markings on the label. The Bag to Ventilator Switch Valve will not operate properly without correct orientation.

The maximum pressure limit in the patient circuit may change significantly when moving the switch from the Ventilator to the Bag position or when switching from the Bag to the Ventilator position. Always check the appropriate pressure limiting device (APL Valve) and verify the proper settings prior to changing switch position. Failure to insure proper APL setting may cause patient injury.

Do not use the Bag to Ventilator Switch Valve if it fails any of the tests in the Operator System Checks. Improper operation of the Bag to Ventilator Switch Valve will cause loss of gases to the patient.

Do not perform any testing or maintenance on the Bag to Ventilator Switch Valve while it is being used to ventilate a patient.

A fire hazard will result from oil or grease applied to any anesthesia or oxygen equipment. In general, oils and greases oxidize readily, and in the presence of oxygen, they will burn violently.

Precautions

A Caution indicates a condition that may lead to equipment damage or malfunction.

Cautions

Damage to the 885A Field Anesthesia Machine and Bag to Ventilator Valve could result if the Bag to Ventilator Valve and the Adapter are not removed from the check valve body before collapsing the gas machine into the case for storage.

No repair should ever be undertaken or attempted by unqualified personnel.

Excess water may impair the function of the valve. To remove excess water, shake the Bag to Ventilator Switch Valve with the switch control in the Vent position and then in the Bag position.

Following sterilization with ethylene oxide, parts should be quarantined in a well ventilated area to allow dissipation of residual gas absorbed by components. In some cases, aeration periods of seven days or more may be required. Aeration time can be decreased when special aeration devices are used. Follow sterilizer manufacturer's recommendations for special aeration periods required.

1/Introduction

1.1 General

This manual describes the proper use and care of the Ohmeda Bag to Ventilator Switch Valve. Operators of this device should read this entire manual before using the Bag to Ventilator Switch Valve, paying extra attention to all precautionary measures recommended. All maintenance procedures in this manual are intended to be performed by the operator of the equipment.

1.2 Arrival Inspection Procedure

1. After removing the Bag to Ventilator Switch Valve from the shipping container, inspect the valve for any signs of damage that may have occurred during shipment. If damage has occurred, immediately file a damage claim with the shipping carrier.

2. Insure that the knob turns freely back and forth from the Bag to Vent positions.

3. Store the original shipping container in an accessible place and use it if you need to reship the valve.

1.3 Initial Checkout Procedure

1. Inspect the Bag to Ventilator Switch Valve for visible damage.

2. Insure that the knob turns freely back and forth from the Bag to Vent positions.

1.4 Storage Requirements

1. The Bag to Ventilator Switch Valve must be stored indoors.

2. The Bag to Ventilator Switch Valve must be stored in a noncorrosive environment.

3. The storage facility temperature must be between -70 °F and 150 °F (-56.7 °C and 65.6 °C).

4. Absolute humidity of the storage facility must not exceed 13 grains per cubic foot.

2/General Information

2.1 Description

The Ohmeda Bag to Ventilator Switch Valve is designed to be used in the Ohmeda 885A Field Anesthesia Machine patient breathing circuit.

1. The switch allows the selection of either an anesthesia ventilator or a standard anesthesia Breathing Bag to ventilate the patient.

2. The switch can be used to select between the Ventilator or the Bag position.

Symbol identification:

identifies the ventilator position

identifies the bag position

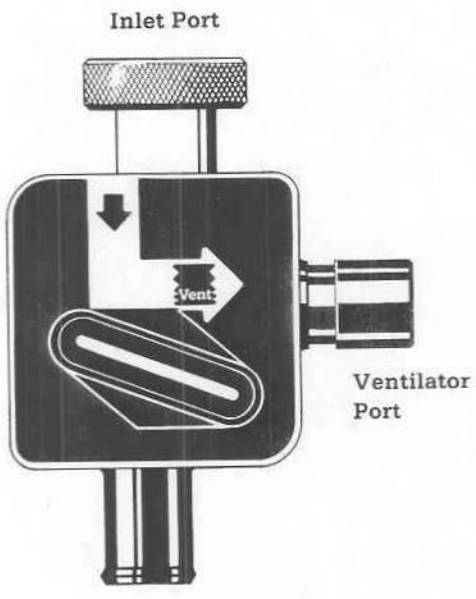


Figure 1
Bag to Ventilator Switch Valve in the Vent Position

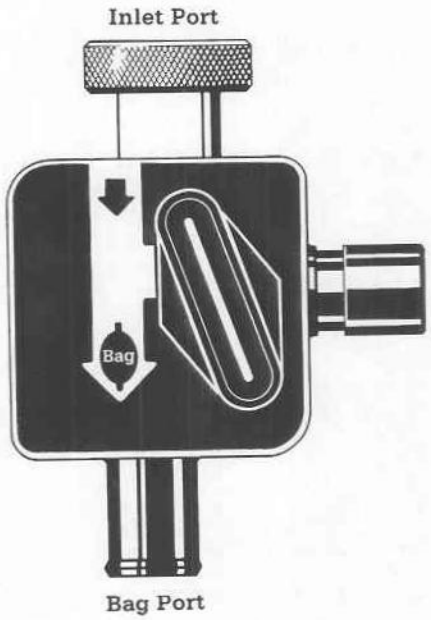


Figure 2
Bag to Ventilator Switch Valve in the Bag Position

3/Set-up Procedures

3.1 Starting, Operating, and Stopping

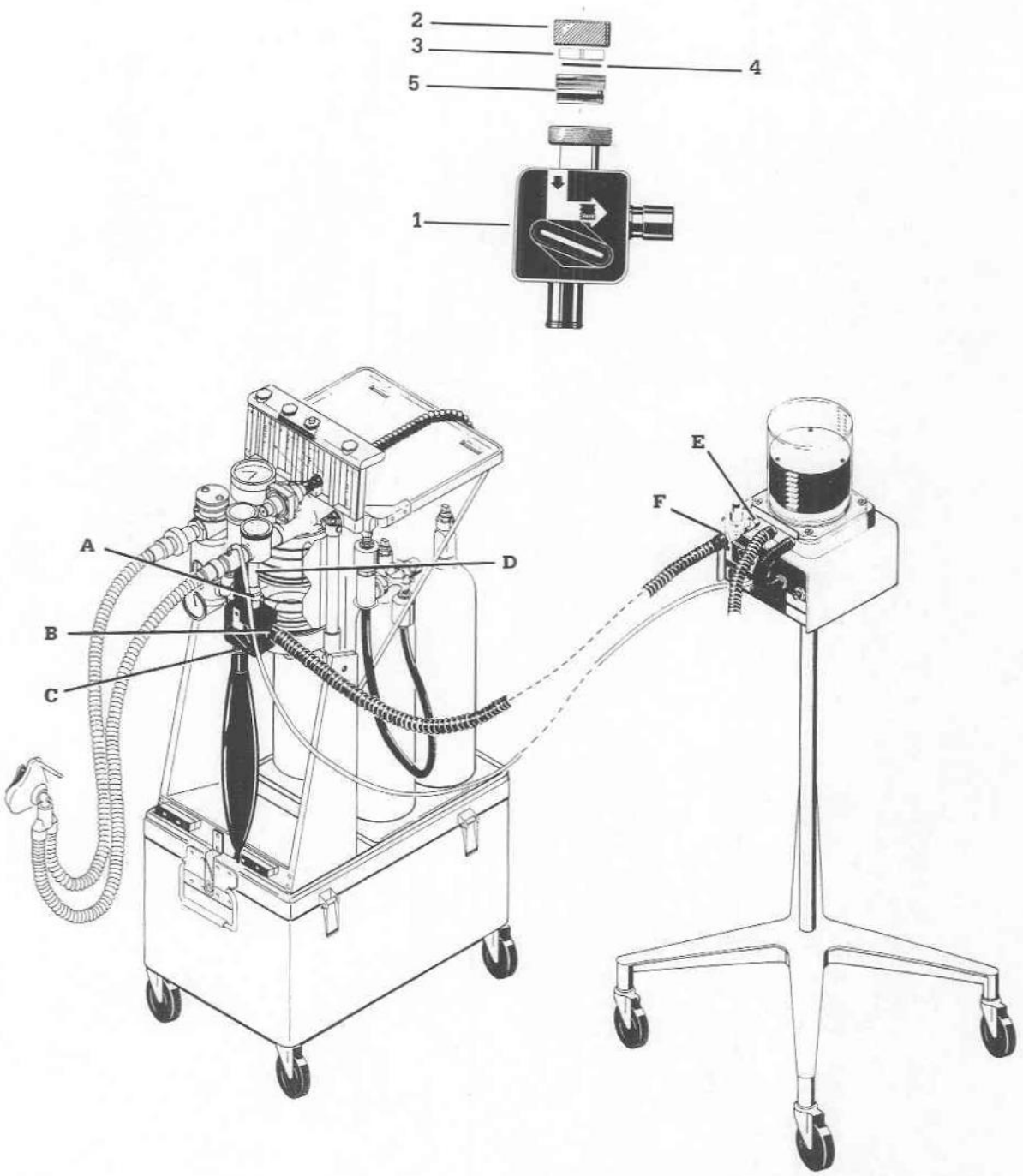
WARNING: The Bag to Ventilator Switch Valve must be correctly oriented in the breathing circuit as indicated by the markings on the label. The Bag to Ventilator Switch Valve will not operate properly without correct orientation.

Refer to Figure 4.

1. Slide the Adapter Nut (2) onto the bag connection port (D) on the 885A Field Anesthesia Machine's Exhalation Check Valve Body. The threaded end of the nut should be directed toward the barbed end of the port.
2. Expand the Adapter Ring (3) onto the bag connection port (D).
3. Position the Adapter Nut (2) over the Adapter Ring (3) and seat the ring completely against the top end of the nut. Slide the ring and nut down against the barb.
4. Install the O-ring (4) into the inner shoulder of the Adapter Body (5).
5. Thread the Adapter Body (5) into the Adapter Nut (2) until hand tight.
6. Thread the knurled nut on the Inlet Port (A), onto the Adapter Body. Tighten both nuts until hand tight.
7. Use a 22 mm corrugated tube to connect the Bag to Ventilator Switch Valve Ventilator Port (B) to the bellows "To Anesthesia Machine" port (E) or to the "PEEP Valve" port (F) if a PEEP Valve is used.
8. Connect a Breathing Bag to the switch valve's Bag Port (C).
9. Place the switch control in position for the desired mode of operation. See Section 4.1.
10. The Bag to Ventilator Switch Valve is a mechanical device and has no independent "Off" switch.

Note: See the 885A Field Anesthesia Machine Operation and Maintenance Manual for further information.

CAUTION: Damage to the 885A Field Anesthesia Machine and Bag to Ventilator Valve could result if the Bag to Ventilator Valve and the Adapter are not removed from the check valve body before collapsing the gas machine into the case for storage.



A - Inlet Port
B - Ventilator Port
C - Bag Port
D - Connection Port
E - "To Anesthesia Machine" Port
F - "To PEEP Valve" Port

1 - Bag to Ventilator Switch Valve
2 - Adapter Nut
3 - Adapter Ring
4 - O-ring
5 - Adapter Body

Figure 4 - Valve Connection with 885A Field Anesthesia Machine

4.1 Controls

The position of the Bag to Ventilator Switch Valve Control determines selection of either the anesthesia ventilator (mechanical ventilation) or the hand-operated Breathing Bag (manual ventilation) for use in a breathing circuit.

WARNING: The maximum pressure limit in the patient circuit may change significantly when moving the switch from the Ventilator to the Bag position or when switching from the Bag to the Ventilator position. Always check the appropriate pressure limiting device (APL Valve) and verify the proper settings prior to changing switch position. Failure to insure proper APL setting may cause patient injury.

A. Anesthesia Ventilator Selection (switch in the Vent position)

During exhalation, patient circuit gases flow in the Inlet Port and out the Ventilator Port to the ventilator. During inspiration, the gases flow in the Ventilator Port and out the Inlet Port, to the patient circuit.

B. Breathing Bag Selection (switch in the Bag position)

During expiration, patient circuit gases flow in the Inlet Port and out the Bag Port to the bag. During inspiration, the gases flow in the Bag Port and out the Inlet Port to the patient circuit.

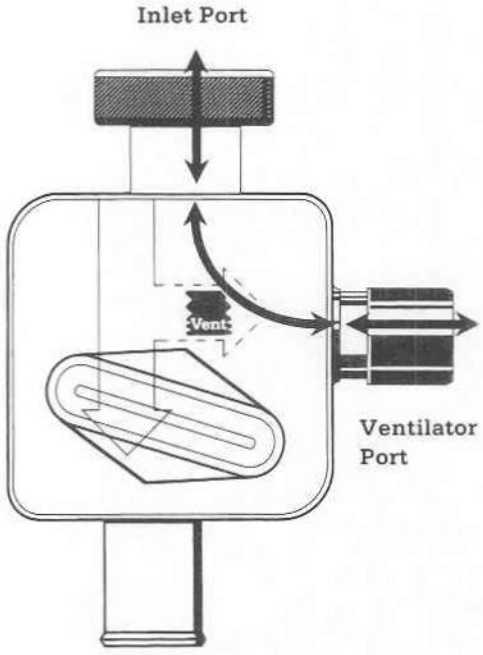


Figure 5
Anesthesia Ventilator Selection

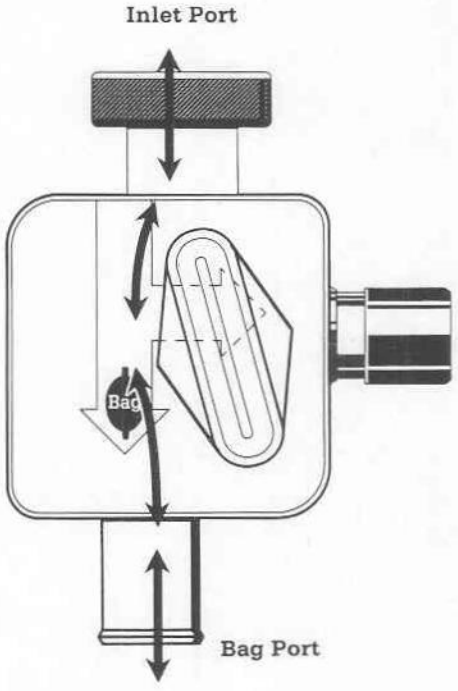


Figure 6
Breathing Bag Selection

4.2 Operator System Checks: Before, During, and After Use

WARNING: Do not use the Bag to Ventilator Switch Valve if it fails any of the tests in the Operator System Checks. Improper operation of the Bag to Ventilator Switch Valve will cause loss of gases to the patient.

WARNING: Do not perform any testing or maintenance on the Bag to Ventilator Switch Valve while it is being used to ventilate a patient.

	Before	During	After
Move the valve switch control back and forth several times from the Bag to Vent position. While moving the valve switch control, ensure that the valve turns easily and a click is heard from one position to the other. If the clicking sound does not occur or if there is some difficulty in switching from one position to the other, remove the valve from use until repaired.	•		•
Check that the Breathing Bag is not filling during mechanical ventilation when the switch is in the Vent position.		•	
Check that the bellows are not filling during manual ventilation when the switch is in the Bag position.		•	

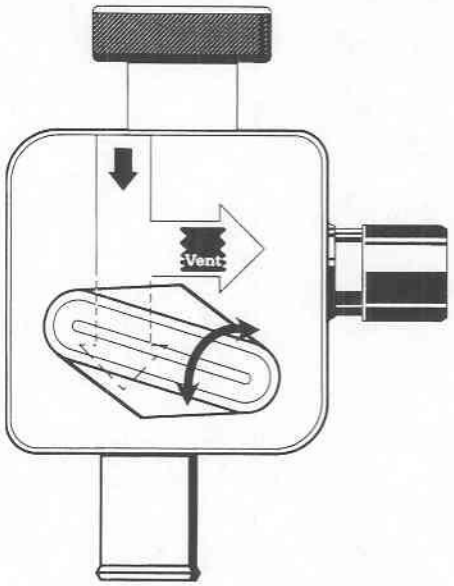


Figure 7 - Valve Switch Positions

5.1 Repair Policy

Do not use malfunctioning equipment. Have the equipment repaired by an Ohmeda Service Representative or other qualified repair personnel. After repair, perform the Leak Test outlined in Section 5.3.C and ensure that the selector switch is functioning properly (see Section 4.2).

Repair and service by an authorized Ohmeda Service Representative helps to insure full reliability. If Ohmeda Service is not available, have a competent person who has training and experience in repairing devices of this nature make repairs.

CAUTION: No repair should ever be undertaken or attempted by unqualified personnel.

Contact the nearest Ohmeda Service Office for assistance. If preferred, the Bag to Ventilator Switch Valve may be sent to the Ohmeda National Service Center for maintenance or repair.

1. Use the original shipping container if available.
2. Enclose a letter detailing the problem and the repairs which may be needed.
3. Prepay the shipping cost. In all cases, other than where Ohmeda's warranty is applicable, repair will be made at Ohmeda's current list price for the replacement parts plus a reasonable labor charge.

5.2 Cleaning and Sterilization

WARNING: A fire hazard will result from oil or grease applied to any anesthesia or oxygen equipment. In general, oils and greases oxidize readily, and in the presence of oxygen, they will burn violently.

CAUTION: Excess water main impair the function of the valve. To remove excess water, shake the Bag to Ventilator Switch Valve with the switch control in the Vent position and then in the Bag position.

A. Liquid Chemical Sterilization

Cold liquid chemical sterilizers which are compatible with rubber, such as Cidex[1] can be used for chemical sterilization. Follow the sterilizer manufacturer's recommendations for specific procedures.

B. Ethylene Oxide Gas Sterilization

An ethylene oxide mixture at 125° to 135°F can be used. Room temperature sterilization with 100% ethylene oxide can also be used.

CAUTION: Following sterilization with ethylene oxide, parts should be quarantined in a well ventilated area to allow dissipation of residual gas absorbed by components. In some cases, aeration periods of seven days or more may be required. Aeration time can be decreased when special aeration devices are used. Follow sterilizer manufacturer's recommendations for special aeration periods required.

1. Cidex is a registered trademark of Arbrook Laboratories

5.3 Scheduled Maintenance

A. General Care of Rubber Articles

Rubber materials will deteriorate over a period of time. Rubber parts should be checked often for swelling, tackiness, or cracking. When any of these conditions are in evidence, the effected parts should be replaced. They should be considered expendable items subject to periodic replacement.

B. Planned Maintenance

The Bag to Ventilator Switch Valve should be serviced every six months by hospital technical personnel. The planned maintenance includes changing internal seals, o-ring, and housing gasket. Service parts Kit, Stock Number 1400-8003-000, includes all parts necessary to service one Bag to Ventilator Switch Valve.

After servicing the valve, perform the Leak Test as outlined in Section 5.3.C.

C. Leak Test (Published Specification)

Perform the following Leak Test weekly. Use the test fixture setup shown in Figure 8.

Note: Steps 1 through 3 check for leaks out of the housing. The switch can be in either position.

1. Connect the test equipment to the Bag to Ventilator Switch Valve. Use a port plug, Stock Number 2900-0001-000, to block off each output port.
2. Using the squeeze bulb, pressurize the Bag to Ventilator Switch Valve to 90 cm H_2O (±1%). Allow five seconds for the pressure to stabilize.
3. Note and record the pressure drop over a 30 second period as indicated on the gauge. The pressure drop should not exceed 5 cm H_2O in 30 seconds.

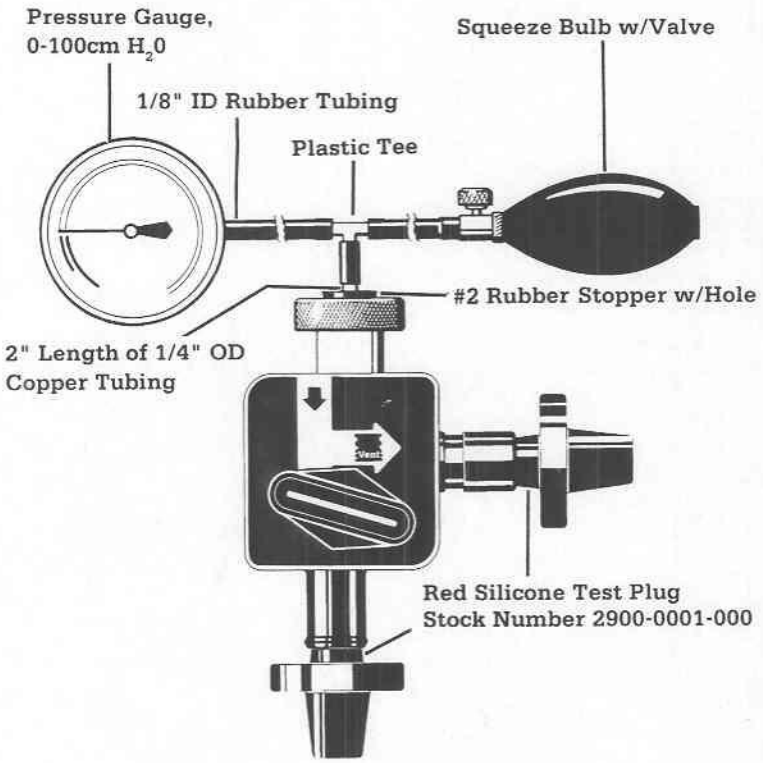


Figure 8 - Leak Test Fixture with Test Plugs

See Figure 9.

4. With the switch in the Bag position, remove the plug from Ventilator Output port.

5. Using the squeeze bulb, pressurize the Bag to Ventilator Switch Valve to 90 cm H_2O (±1%). Allow five seconds for the pressure to stabilize.

6. Note and record the pressure drop over a 30 second period as indicated on the gauge. The pressure drop should not exceed 5 cm H_2O in 30 seconds.

7. If the above specifications cannot be met, contact the nearest Ohmeda Service Office for service assistance.

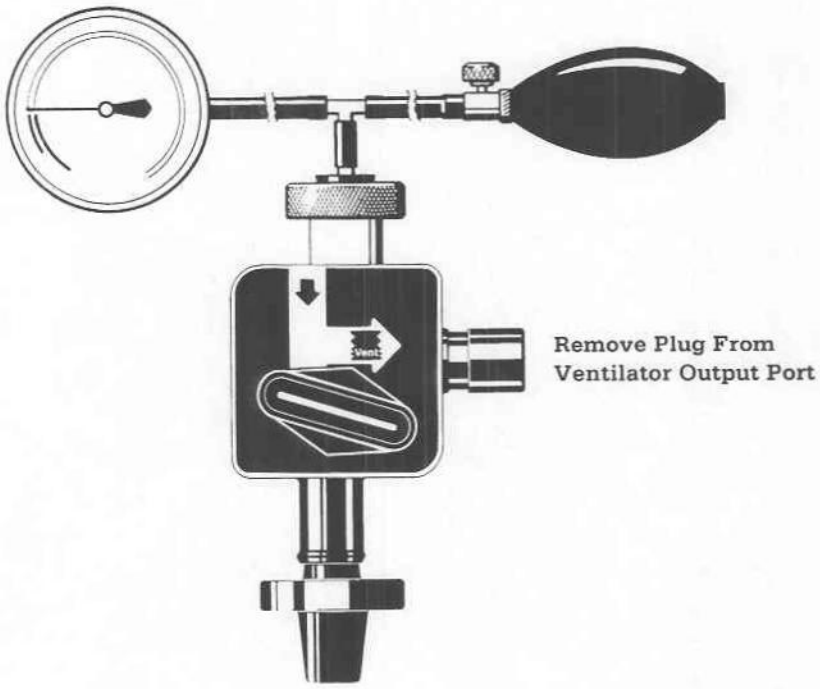


Figure 9 - Bag position Leak Test with Test Plug on Bag Port

See Figure 10.

8. Plug the Ventilator Output port and remove plug from the Bag Output port.

9. Turn the switch to the Vent position.

10. Using the squeeze bulb, pressurize the Bag to Ventilator Switch Valve to 90 cm H_2O (±1%). Allow five seconds for the pressure to stabilize.

11. Note and record the pressure drop over a 30 second period as indicated on the gauge. The pressure drop should not exceed 5 cm H_2O in 30 seconds.

12. If the above specifications cannot be met, contact the nearest Ohmeda Service Office for service assistance.

13. Add the pressure drops recorded in steps 3, 6, and 11. This total should not exceed 10 cm H_2O in 30 seconds. If the individual pressure drops are within the limits but the total pressure drop is not acceptable, contact the nearest Ohmeda Service Office for service assistance.

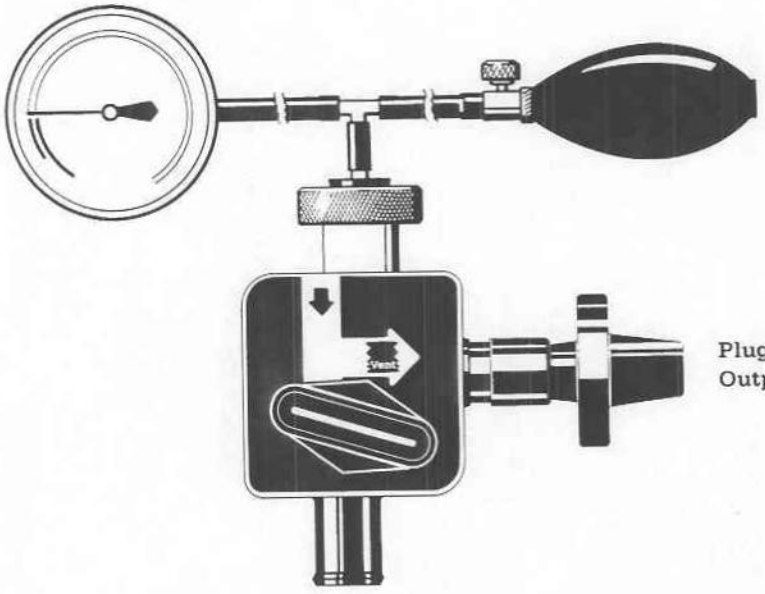


Figure 10 - Vent Position Leak Test with Test Plug on Vent Port

Warranty

This Product is sold by Ohmeda under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this Product directly from Ohmeda or Ohmeda's Authorized Dealers as new merchandise and are extended to the first Buyer thereof, other than for purpose of resale.

For a period of twelve (12) months from the date of original delivery to Buyer or to Buyer's order, but in no event for a period of more than two years from the date of original delivery by Ohmeda to an Ohmeda Authorized Dealer, this Product, other than its expendable parts, is warranted to be free from functional defects in materials and workmanship and to conform to the description of the Product contained in this operation manual and accompanying labels and/or inserts, provided that the same is properly operated under conditions of normal use, that regular periodic maintenance and service is performed and that replacements and repairs are made in accordance with the instructions provided. This same warranty is made for a period of thirty (30) days with respect to the expendable parts. The foregoing warranties shall not apply if the Product has been repaired other than by Ohmeda or in accordance with written instructions provided by Ohmeda, or altered by anyone other than Ohmeda, or if the Product has been subject to abuse, misuse, negligence, or accident.

Ohmeda's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at Ohmeda's option, a Product, which is telephonically reported to the nearest Ohmeda Regional Service Office and which, if so advised by Ohmeda, is thereafter returned with a statement of the observed deficiency, not later than seven (7) days after the expiration date of the applicable warranty, to the designated Ohmeda Regional Service Office during normal business hours, transportation charges prepaid, and which, upon Ohmeda's examination, is found not to conform with the above warranties. Ohmeda *shall not be otherwise liable for any damages including but not limited to incidental damages, consequential damages, or special damages.*

There are no express or implied warranties which extend beyond the warranties herein above set forth. Ohmeda *makes no warranty of merchantability or fitness for a particular purpose with respect to the Product or thereof.*

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Critical Care Worldwide

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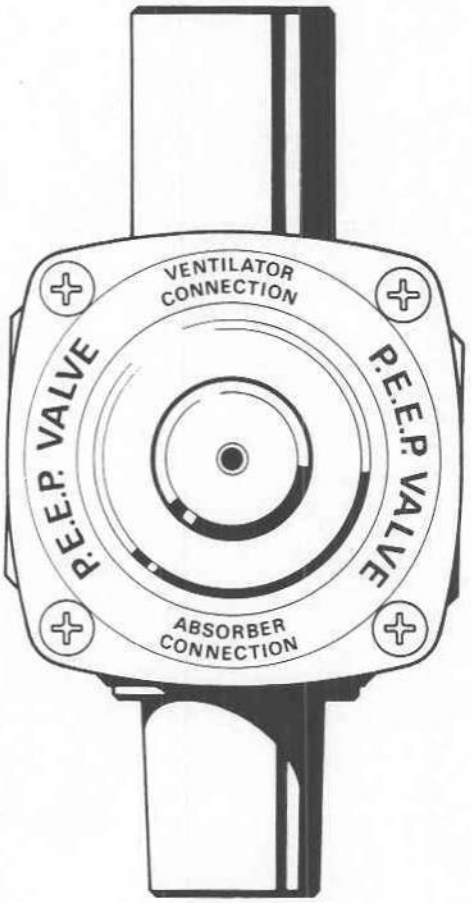
Ohmeda

Positive End Expiratory Pressure Valve (PEEP Valve)

For use with 885A Field Anesthesia Machine

Operation and Maintenance Manual



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User Responsibility

Read this manual before operating the equipment. Pay special attention to all Warnings and Cautions.

This Product will perform in conformity with the description thereof contained in this operating manual and accompanying labels and/or inserts, when assembled, operated, maintained and repaired in accordance with instructions provided. This Product must be checked periodically. A defective Product should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, Ohmeda recommends that a telephonic or written request for service advice be made to the nearest Ohmeda Regional Service Office. This Product or any of its parts should not be repaired other than in accordance with written instructions provided by Ohmeda and by Ohmeda trained personnel. The Product must not be altered without the prior written approval of Ohmeda's Safety Department. The user of this Product shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, improper repair, damage, or alteration by anyone other than Ohmeda.

CAUTION: Federal law in USA and Canada restricts this device to sale by or on the order of a licensed medical practitioner.

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Precautions

As used in this manual, a Warning indicates a potentially life threatening situation.

Warnings

The PEEP Valve should be used with volume and pressure monitoring. Adding PEEP to the circuit will affect both circuit volume and pressure.

When using mechanical ventilation, especially during Positive End Expiratory Pressure, the APL Valve must be turned to maximum pressure (fully clockwise). If the APL Valve is not turned fully clockwise, full volume will not be delivered and the ventilator's "Set Volume Not Delivered" lamp and alarm will not activate.

Remove the PEEP Valve when not in use. Deposits from the breathing circuit can collect in the PEEP Valve and foul the mechanism.

When the PEEP Valve is used, the Low Pressure Alarm on the Anesthesia Ventilator may not be operational at high inspiratory flow rates due to the flow resistance of the PEEP Valve.

When the PEEP Valve is used in volume limited operation, the peak inspiratory pressure on inhalation increases by the same value as the positive end expiratory pressure. This may exceed the prescribed parameters.

Reduced total volume will be delivered when the PEEP Valve is in use because some of the delivered volume is used to overcome the elevated baseline pressure. When the PEEP Valve is used in pressure limited operation, less total volume is delivered during inspiration. Use of a volume monitor in the patient breathing circuit is recommended to help ensure full volume delivery.

When the patient is breathing spontaneously or is assisted by the ventilator, use of the PEEP Valve will result in an increased exhalation effort even if the valve is set for minimum PEEP. This may cause decreased tidal volume, decreased minute volume, altered I:E ratio and delay in appropriate gas exchange. Spontaneous or assisted ventilation may not be possible.

A fire hazard will result from oil or grease applied to any anesthesia or oxygen equipment. In general, oils and greases oxidize readily, and in the presence of oxygen, they will burn violently.

A Caution indicates a condition that may lead to equipment damage or malfunction.

Cautions

Do not obstruct the Atmospheric Diaphragm Vent in the Control Knob of the PEEP Valve.

No repair should ever be undertaken by unqualified personnel.

The Faceplate must be mounted so that each connection is correctly labeled. The words "Ventilator Connection" must be next to the 22 mm female taper port. The words "Absorber Connection" must be next to the outlet port (22 mm male taper).

Remove excess water from the PEEP Valve following the cleaning and sterilizing procedures.

If liquid sterilization is used, the valve must be thoroughly rinsed with sterile distilled water to prevent residue from being deposited in the internal passages. Dry all parts thoroughly. Follow sterilizer manufacturer's recommendations for drying rubber parts.

If ethylene oxide is used for sterilization, the components should be quarantined in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the material. Follow sterilizer manufacturer's recommendations for specific aeration periods required.

1/Description

1.1 General

This manual describes the proper use and care of the Ohmeda PEEP Valve. Operators of this device should read this entire manual before using the PEEP Valve, paying extra attention to all precautionary measures recommended. All maintenance procedures in this manual are intended to be performed by the operator of the equipment.

The Positive End Expiratory Pressure Valve or PEEP Valve, allows the operator to select a positive end expiratory pressure within an anesthesia breathing circuit. The pressure range that can be selected varies from approximately 1 cm H_2O to 15 cm H_2O.

The setting of the control is determined by the indication of the airway pressure gauge on the absorber during the expiratory segment of the breathing cycle.

After control on the PEEP Valve has been set to the desired end pressure, continuous positive end expiratory pressure consistent with that setting will be maintained in the breathing circuit during the expiration phase.

The PEEP Valve is designed to fit on the Ohmeda 7000 Electronic Anesthesia Ventilator. See Figure 2.

WARNING: The PEEP Valve should be used with volume and pressure monitoring. Adding PEEP to the circuit will affect both circuit volume and pressure.

WARNING: When using mechanical ventilation, especially during Positive End Expiratory Pressure, the APL Valve must be turned to maximum pressure (fully clockwise). If the APL Valve is not turned fully clockwise, full volume will not be delivered and the ventilator's "Set Volume Not Delivered" lamp and alarm will not activate.

1.2 Arrival Inspection Procedure

1. Inspect the PEEP Valve for visible damage.
2. Ensure that the knob turns freely through the entire range of motion.
3. Ensure that the Absorber Connection port is threaded on tight.

1.3 Initial Checkout Procedure

1. Ensure that the Flapper Valve has uniform contact with the seat.
2. Ensure that the Flapper Valve is not adhered to the seat.

1.4 Storage Requirements

1. The PEEP Valve must be stored indoors.
2. The PEEP Valve must be stored in a noncorrosive environment.
3. The storage facility temperature must be between -70 °F and 150 °F (-56.7 °C and 65.6 °C).
4. Absolute humidity of the storage facility must not exceed 13 grains per cubic foot.

1.5 Theory of Operation

On the inspiratory phase, the PEEP Valve serves as a conduit for the gas. As the ventilator bellows fall, gas is pushed into the inlet port of the PEEP Valve through the flapper valve and then into the breathing circuit. During the expiratory phase of the ventilation cycle, gas flows through the PEEP Valve past the diaphragm and diaphragm seat, and on to the bellows which fills with a mixture of exhaled gases. When the PEEP Valve is on, the exhaled gas must have sufficient pressure to lift a diaphragm held down against its seat by the PEEP Valve spring. The PEEP Valve control setting determines the spring force on the diaphragm thereby controlling pressure during exhalation. When the airway pressure is insufficient to overcome the force of the spring on the diaphragm, the patient expiratory flow stops thus maintaining the value of PEEP set. The effect of the PEEP Valve on the ventilation cycle is illustrated in Figure 1.

As configured on the 885A Field Anesthesia Machine, the PEEP Valve can only be used with mechanically controlled patient ventilation.

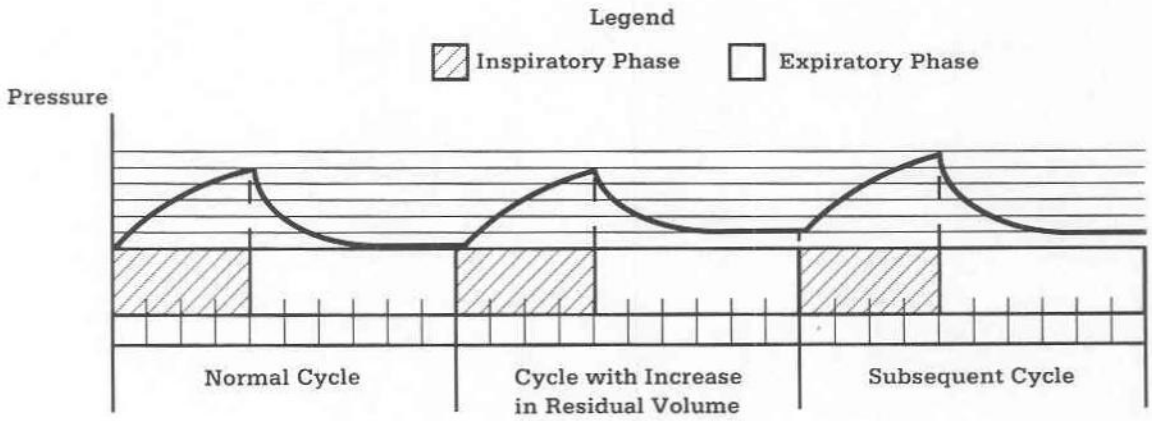

Figure 1 - Effect of PEEP Valve on breathing cycle.

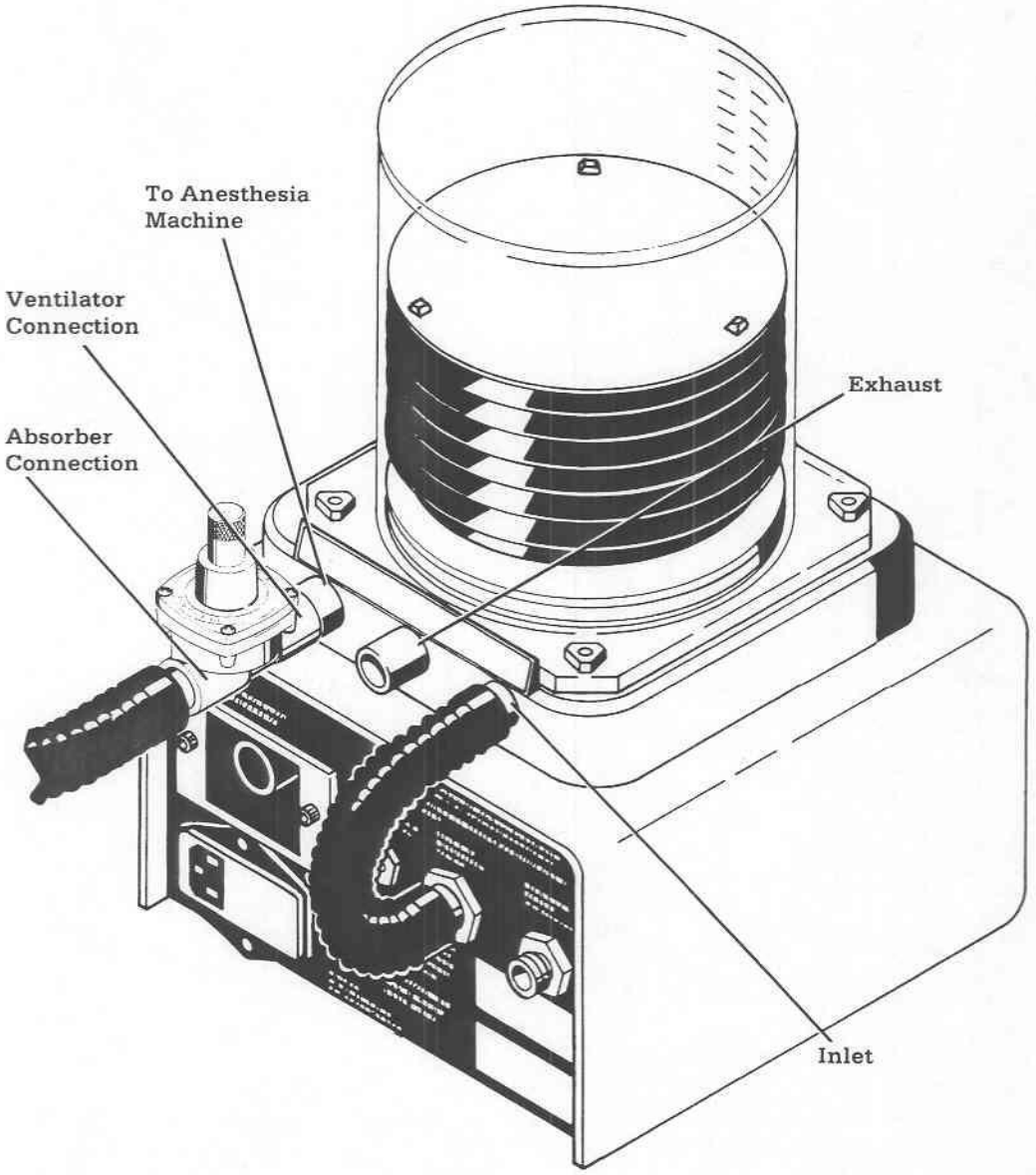

Figure 2 - Mounting the PEEP Valve to the Ventilator

2/Setup and Operation

2.1 To mount the PEEP Valve

1. Attach the PEEP Valve's "Ventilator Connection" port to the "To Anesthesia Machine" port (see Figure 2).

2. Attach the 22 mm breathing circuit tube to the outlet port labeled "Absorber Connection" of the PEEP Valve.

3. Connect the remaining components of the anesthesia breathing circuit including the absorber and the 885A Field Anesthesia Machine.

WARNING: Remove the PEEP Valve when not in use. Deposits from the breathing circuit can collect in the PEEP Valve and foul the mechanism.

2.2 To set the Control Knob on the PEEP Valve

Note: Before adjusting the PEEP Valve control knob, make sure that all components of the anesthesia system are properly connected including the Anesthesia Ventilator, PEEP Valve, absorber, anesthesia machine, and connecting tubes. Read the operation and maintenance manuals for each component in the system. Set up and operate all anesthesia equipment in accordance with accepted clinical practice.

1. Set the ventilator controls as desired and set a flow of at least 2 liters per minute (L/min) on the anesthesia machine.

2. Turn the knob on the PEEP Valve counterclockwise as far as it will go before turning the ventilator on. Pressure will be lowest, approximately 1 cm of H_2O when the knob is fully counterclockwise.

3. Turn the knob clockwise to increase pressure. Watch the pressure gauge on the absorber until the desired expiration pressure is reached. Maximum pressure is approximately 15 cm H_2O.

2.3 Starting, Operating, and Stopping

1. The Positive End Expiratory Pressure Valve (PEEP Valve) allows the operator to select a positive end expiratory pressure within the anesthesia breathing circuit. The pressure range that can be selected varies from approximately 1 cm H_2O to 15 cm H_2O.

2. The setting of the Ventilator PEEP Valve control is determined by the indication on the absorber airway pressure gauge during the expiratory segment of the breathing cycle. See Figure 3.

3. After the control on the PEEP Valve has been set to the desired end pressure, continuous positive end expiratory pressure will be maintained in the breathing circuit during the expiration phase.

4. The PEEP Valve has no independent "Off" Control. The PEEP Valve turns off when the system is turned off. The minimum PEEP setting is achieved by turning the valve fully counterclockwise.

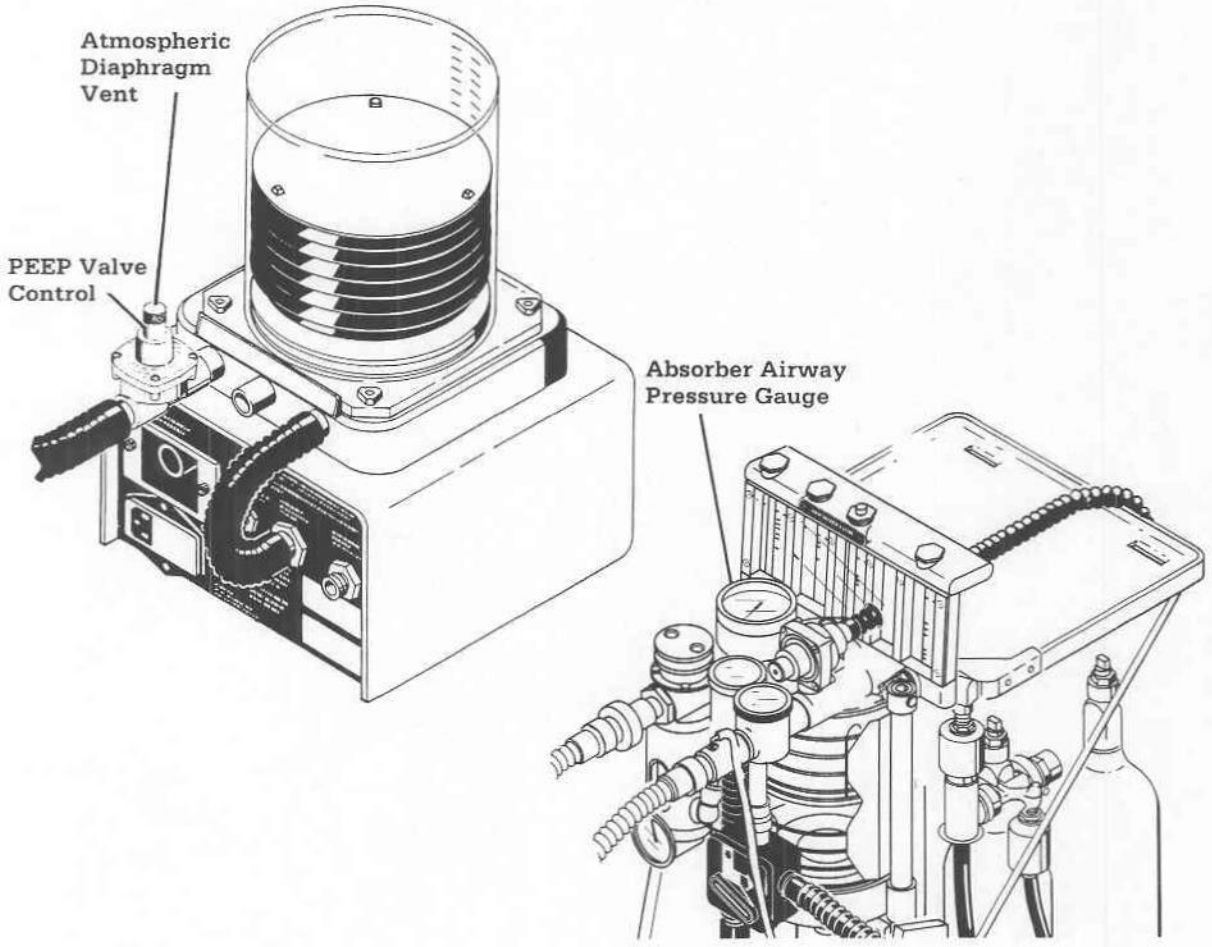

Figure 3 - Setting the PEEP Valve Control

2.4 Low Pressure Alarm test

WARNING: When the PEEP Valve is used, the Low Pressure Alarm on the Anesthesia Ventilator may not be operational at high inspiratory flow rates due to the flow resistance of the PEEP Valve.

1. Assemble the anesthesia breathing circuit but do not attach to the patient or test bag.

2. Mount the PEEP Valve as described in this manual. See Section 2.1.

3. Set the ventilator Minute Volume and Rate controls.

4. Check for proper operation of the Low Pressure Alarm by allowing the ventilator to cycle with the circuit "Y" connector disconnected from the patient. An audible alarm after 15 seconds indicates that the alarm is functioning properly.

5. If there is not an alarm after 15 seconds, the Low Pressure Alarm is inoperative. This condition may be corrected by turning down the Minute Volume on the 7000 ventilator.

CAUTION: Do not obstruct the Atmospheric Diaphragm Vent in the Control Knob of the PEEP Valve.

6. If the valve chatters or vibrates, disassemble the valve and lubricate the outside surface of the Spring Sleeve with a light film of Vac-Kote[1]. See Figure 4.

1. Vac-Kote is the registered trademark of the Ball Aerospace Systems Division.

2.6 How the PEEP Valve affects the Anesthesia Ventilator

The use of the PEEP Valve in an anesthesia breathing circuit will effect the volume delivered and/or the peak pressure.

WARNING: When the PEEP Valve is used in volume limited operation, the peak inspiratory pressure on inhalation increases by the same value as the positive end expiratory pressure. This may exceed the prescribed parameters.

WARNING: Reduced total volume will be delivered when the PEEP Valve is in use because some of the delivered volume is used to overcome the elevated baseline pressure. When the PEEP Valve is used in pressure limited operation, less total volume is delivered during inspiration. Use of a volume monitor in the patient breathing circuit is recommended to help ensure full volume delivery.

During use of the PEEP Valve, the maximum inspiratory circuit pressure may be reached before full volume is delivered. This condition will activate the ventilator's "Set Volume Not Delivered" lamp and alarm.

WARNING: When the patient is breathing spontaneously or is assisted by the ventilator, use of the PEEP Valve will result in an increased exhalation effort even if the valve is set for minimum PEEP. This may cause decreased tidal volume, decreased minute volume, altered I:E ratio and delay in appropriate gas exchange. Spontaneous or assisted ventilation may not be possible.

2.7 Ventilator-Absorber-Anesthesia Machine Controls

A. Flow from Gas Machine

A compensating flow of gas must be provided to the anesthesia breathing circuit to prevent the PEEP level from decaying. During exhalation, gas can escape past the PEEP Valve diaphragm at a flow rate of up to 700 cc/min.

B. Absorber APL Valve

The APL Valve should be set to maximum pressure (fully clockwise).

WARNING: When using mechanical ventilation, especially during Positive End Expiratory Pressure, the APL Valve must be turned to maximum pressure (fully clockwise). If the APL Valve is not turned fully clockwise, full volume will not be delivered and the ventilator's "Set Volume Not Delivered" lamp and alarm will not activate.

C. Ventilator I:E Ratio

The ratio of inspiration to expiration time must be set to provide for sufficient expiratory time to allow the patient circuit pressure to return to the established baseline. If the expiratory time is very short, there may not be sufficient time for the patient circuit pressure to fall to the PEEP Valve level before a new inspiratory cycle begins.

D. Ventilator Minute Volume and Rate Controls

Together, these ventilator controls determine the tidal volume delivered. PEEP Valve settings may substantially reduce the tidal volume delivered to the patient due to elevated baseline pressure, high peak pressure, circuit compliance and resistance. The ventilator Minute Volume and Rate Controls may require adjustment to compensate for the effects of PEEP Valve operation. In general, there are two rules when adjusting the ventilator controls for satisfactory PEEP operation.

1. On inspiration, the peak inspiratory pressure attained should exceed PEEP level set by the PEEP Valve.

2. On expiration, the bellows should be allowed to rise to the top of the bellows canister before a new inspiration begins.

2.8 Operator System Checks: Before, During, and After Use

	Before	During	After
Ensure that the Flapper Valve has uniform contact with the seat.	•		•
Ensure that the Flapper Valve is not adhered to the seat.	•		•
Ensure that the knob turns freely through the entire range of motion.	•		•
Ensure that the Absorber Connection port is threaded on tight.	•		•
Confirm that the desired PEEP pressure is maintained on the absorber pressure gauge during the expiratory segment of the breathing cycle.		•	

3/Maintenance

3.1 Repair Policy

Do not use malfunctioning equipment. Have the equipment repaired by an Ohmeda Service Representative or other qualified repair personnel. After repair, test the equipment to make sure it operates according to Ohmeda's published specifications. To ensure proper operation, test and adjust the PEEP Valve installation in accordance with Sections 3.6.

Repair and service by an authorized Ohmeda Service Representative helps to insure full reliability. If Ohmeda Service is not available, have a competent person who has training and experience in repairing devices of this nature make repairs.

CAUTION: No repair should ever be undertaken by unqualified personnel.

Contact the nearest Ohmeda Service Office for assistance. If preferred, the PEEP Valve may be sent to the Ohmeda National Service Center for maintenance or repair.

1. Use the original shipping container if available.
2. Enclose a letter detailing the problem and the repairs which may be needed.
3. Prepay the shipping cost. In all cases, other than where Ohmeda's warranty is applicable, repair will be made at Ohmeda's current list price for the replacement parts plus a reasonable labor charge.

3.2 Disassembly

Disassembly of the PEEP Valve for replacement of parts should be performed in the following order. Refer to Figure 4.

1. Using a Phillips screwdriver, loosen and remove the 4 Phillips head screws on the faceplate of the PEEP Valve.

2. Lift off the faceplate exposing the spring.

3. Remove the spring sleeve and back up plate revealing the rubber diaphragm beneath. The rubber diaphragm should be checked for swelling, tackiness, cracking or any defect that might impair operation. When any of these conditions are in evidence, the diaphragm should be replaced.

4. Inspect the flapper valve and O-rings. These should be checked for swelling, tackiness, cracking, or any defect that might impair operation. When any of these conditions are in evidence, the flapper valve and/or O-rings should be replaced. Remove the O-rings with forceps.

3.3 Reassembly

1. Make certain that all components are clean and dry prior to reassembly. Moisture remaining in the rubber diaphragm or valve can cause tackiness and interfere with normal functioning.

2. Reassemble components in the reverse order of the steps in Section 3.2. Take care not to puncture the diaphragm or flapper valve on reassembly and check that they are properly seated before remounting the faceplate and tightening the screws. Figure 5 shows the proper orientation of the faceplate when reassembling the PEEP Valve.

CAUTION: The Faceplate must be mounted so that each connection is correctly labeled. The words "Ventilator Connection" must be next to the 22 mm female taper port. The words "Absorber Connection" must be next to the outlet port (22 mm male taper).

3.4 Items Not Supplied with the PEEP Valve but necessary for operation

No additional items are required to use the PEEP Valve as described in this manual.

3.5 Items Supplied with the PEEP Valve (Illustrated Parts List)

Important: Replacement of these parts may require special tools and test apparatus. Repair or replacement should be performed at the Ohmeda National Service Center. See Repair Policy and Procedure in Section 3.1.

Description	Stock Number
1. Outlet Port	0204-5577-535
2. O-Ring, 1 inch ID x 1.25 OD	0210-0553-300
3. Flapper Valve	0211-1451-100
4. PEEP Valve Body	*
5. Inlet Port	*
6. Diaphragm	0211-1443-300
7. Spring Sleeve	0207-1389-500
8. Back Up Plate	0219-7465-500
9. Spring	0203-3519-300
10. Screws (4)	0140-6427-105
11. Control Knob	*
12. Faceplate	*

(*) These items can not be ordered separately. The Stock Number for the complete PEEP Valve assembly is 0397-2112-147.

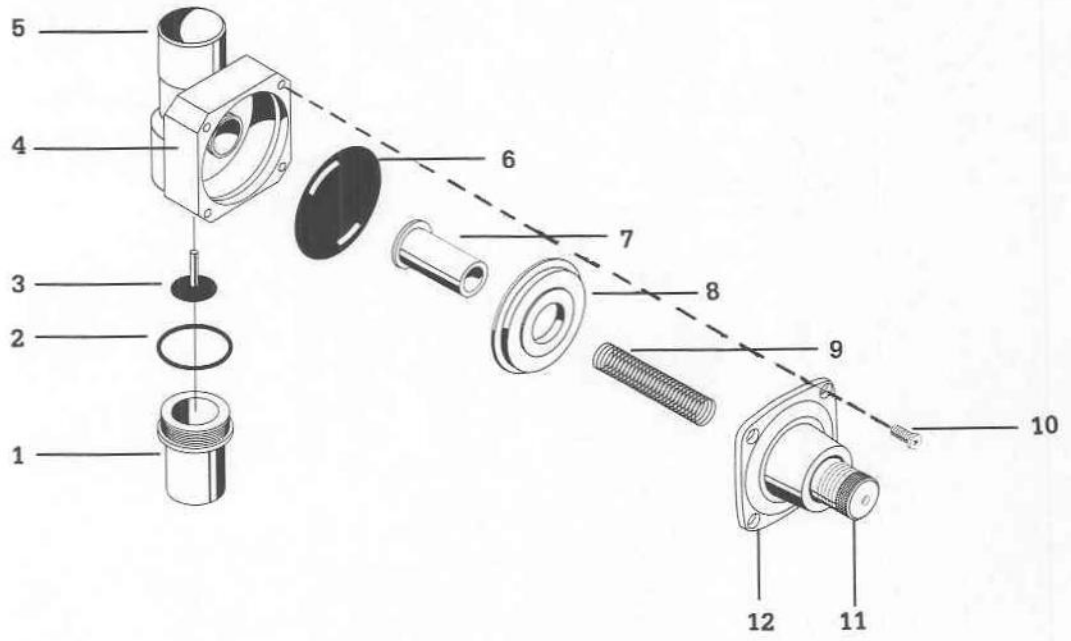

Figure 4 - Internal Components of the PEEP Valve

3.6 Procedure for testing after reassembly

1. Connect the PEEP Valve to a ventilator per instructions in Section 2.1 and 2.2.
2. Attach a test lung to the anesthesia breathing circuit.
3. Using the pressure gauge on the absorber, confirm that the PEEP Valve control knob can regulate any positive end expiratory pressure up to maximum of approximately 15 cm of H_2O.

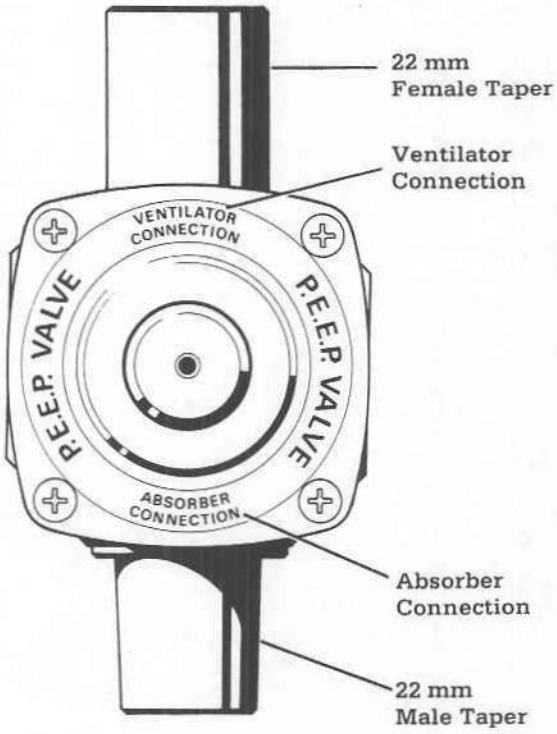

Figure 5 - Orientation of Faceplate

3.7 Cleaning and Sterilization

WARNING: A fire hazard will result from oil or grease applied to any anesthesia or oxygen equipment. In general, oils and greases oxidize readily, and in the presence of oxygen, they will burn violently.

CAUTION: Remove excess water from the PEEP Valve following the cleaning and sterilizing procedures.

A. Preparation

1. Back the control knob counterclockwise until it stops.
2. Unscrew the outlet port. See Figure 4.
3. Remove the flapper valve. All three parts may be liquid sterilized, gas sterilized, or steam autoclaved.

B. Liquid Chemical

1. Make sure that the liquid is compatible with plastics used in the PEEP Valve. This is not generally a problem.
2. Cold liquid chemical sterilizers which are compatible with rubber, such as Cidex[1] can be used for chemical sterilization. Follow the sterilizer manufacturer's recommendations for specific procedures.

CAUTION: If liquid sterilization is used, the valve must be thoroughly rinsed with sterile distilled water to prevent residue from being deposited in the internal passages. Dry all parts thoroughly. Follow sterilizer manufacturer's recommendations for drying rubber parts.

3. After liquid sterilization, disassemble the valve and lubricate the spring sleeve (item 7, Figure 4) with Vac-Kote.
4. Reassemble the PEEP Valve. Follow the procedure in Section 3.6 for testing the unit for proper operation. See Figure 5 for proper remounting of the faceplate.

1. Cidex is a registered trademark of Arbrook Laboratories

C. Gas (Ethylene Oxide)

Ethylene oxide mixtures can be used at elevated temperatures of 125-135 °F. Room temperature sterilization with 100 °F ethylene oxide can also be used.

CAUTION: If ethylene oxide is used for sterilization, the components should be quarantined in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the material. Follow sterilizer manufacturer's recommendations for specific aeration periods required.

D. Steam Autoclaving

1. Wrap parts in muslin.
2. Place the wrapped parts in the autoclave and sterilize at 250 °F for 4 minutes.
3. Upon completion of the cycle, turn off the steam, open the exhaust and turn on the vacuum.
4. Set the temperature at 150 °F dry heat and hold for 2 to 2.5 hours.
5. Allow the rubber components to stand at room temperature for 24 hours for the components to regain their physical properties.

Note: Other hospital approved autoclaving procedures may be substituted for the steps above.

Warranty

This Product is sold by Ohmeda under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this Product directly from Ohmeda or Ohmeda's Authorized Dealers as new merchandise and are extended to the Buyer thereof, other than for the purpose of resale.

For a period of twelve (12) months from the date of original delivery to Buyer or to Buyer's order, but in no event for a period of more than two years from the date of original delivery by Ohmeda to an Ohmeda Authorized Dealer, this Product, other than its expendable parts, is warranted to be free from functional defects in materials and workmanship and conform to the description of the Product contained in this operation manual and accompanying labels and/or inserts, provided that the same is properly operated under the conditions of normal use, that regular periodic maintenance and service is performed and that replacements and repairs are made in accordance with the instructions provided. This same warranty is made for a period of thirty (30) days with respect to expendable parts. The foregoing warranties shall not apply if the Product has been repaired other than by Ohmeda or in accordance with written instructions provided by Ohmeda or altered by anyone other than Ohmeda or if the Product has been subject to abuse, misuse, negligence, or accident.

Ohmeda's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at Ohmeda's option a Product, which is telephonically reported to the nearest Ohmeda Regional Service Office and which, if so advised by Ohmeda, is thereafter returned with a statement of the observed deficiency, not later than seven (7) days after the expiration date of the applicable warranty, to the designated Ohmeda Service Office during normal business hours, transportation charges prepaid, and which, upon Ohmeda's examination, is found not to conform with above warranties. Ohmeda *shall not be otherwise liable for any damages including but not limited to incidental damages, consequential damages, or special damages.*

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